Upper and Lower Henrys Fork Subbasins

2021 Sediment and Bacteria TMDLs

Hydrologic Unit Codes 17040202 and 17040203

State of Idaho
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Abbreviations, Acronyms, and Symbols

§303(d) refers to section 303 subsection (d) of the Clean Water Act, or a list of impaired water bodies required by this section

AU assessment unit

BAG basin advisory group

BLM United States Bureau of Land Management

BMP best management practice

BOR United States Bureau of Reclamation

BURP Beneficial Use Reconnaissance Program

C Celsius

CFR Code of Federal Regulations (refers to citations in the federal administrative rules)

CGP Construction General Permit

COLD use designation for cold water aquatic life

CTNF Caribou-Targhee National Forest

DEQ Idaho Department of Environmental Quality

DO dissolved oxygen

DWS	domestic water supply
E. coli	*Escherichia coli*
EPA	United States Environmental Protection Agency
F	Fahrenheit
GIS	geographic information system
HFF	Henry’s Fork Foundation
HUC	hydrologic unit code
IDAPA	Refers to citations of Idaho administrative rules
IDFG	Idaho Department of Fish and Game
LA	load allocation
LC	load capacity
MOS	margin of safety
MS4s	municipal separate storm sewer systems
MSGP	Multi-Sector General Permit
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
PCR	primary contact recreation
PIT	passive integrated transponder
SCR	secondary contact recreation
SS	salmonid spawning
SEI	streambank erosion inventory
SWPPP	stormwater pollution prevention plan
TMDL	total maximum daily load
US	United States
USFS	United States Forest Service
WAG	watershed advisory group

Executive Summary

The federal Clean Water Act requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters. States and tribes, pursuant to Section 303 of the Clean Water Act, are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the nation's waters whenever possible. Section 303(d) of the Clean Water Act establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards).

States and tribes must periodically publish a priority list (a "§303(d) list") of impaired waters. Currently, this list is published every 2 years as the list of Category 5 water bodies in Idaho's Integrated Report. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. This document addresses 7 assessment units (21 water bodies) in the Upper and Lower Henrys Fork subbasins that have been placed in Category 5 of Idaho's most recent federally approved Integrated Report (DEQ, 2018).

This document describes the key physical and biological characteristics of the subbasins, water quality concerns and status, pollutant sources, and recent pollution control actions in the Upper and Lower Henrys Fork subbasins located in eastern Idaho. For more detailed information about the subbasins and previous TMDLs, see the *Upper and Lower Henry's Fork Total Maximum Daily Loads: Addendum to the Upper Henry's Fork Subbasin Assessment and TMDLs* (DEQ 2010a).

The TMDL analysis establishes water quality targets and load capacities, estimates existing pollutant loads, and allocates responsibility for load reductions needed to return listed waters to a condition meeting water quality standards. It also identifies implementation strategies—including reasonable time frames, approach, responsible parties, and monitoring strategies—necessary to achieve load reductions and meet water quality standards.

Subbasins at a Glance

The Upper (hydrologic unit code [HUC] 17040202) and Lower (HUC 17040203) Henrys Fork subbasins are located in Idaho and Wyoming, with portions of both in Yellowstone National Park (Figure A). The majority of the subbasins are located on public lands. The United States Forest Service (USFS) is the largest land management agency in the subbasins, managing approximately 45% of the total area. Some eastern portions of the subbasins are found within Wyoming; however, 97% of the Upper Henrys Fork and 70% of the Lower Henrys Fork subbasins are contained within Idaho.

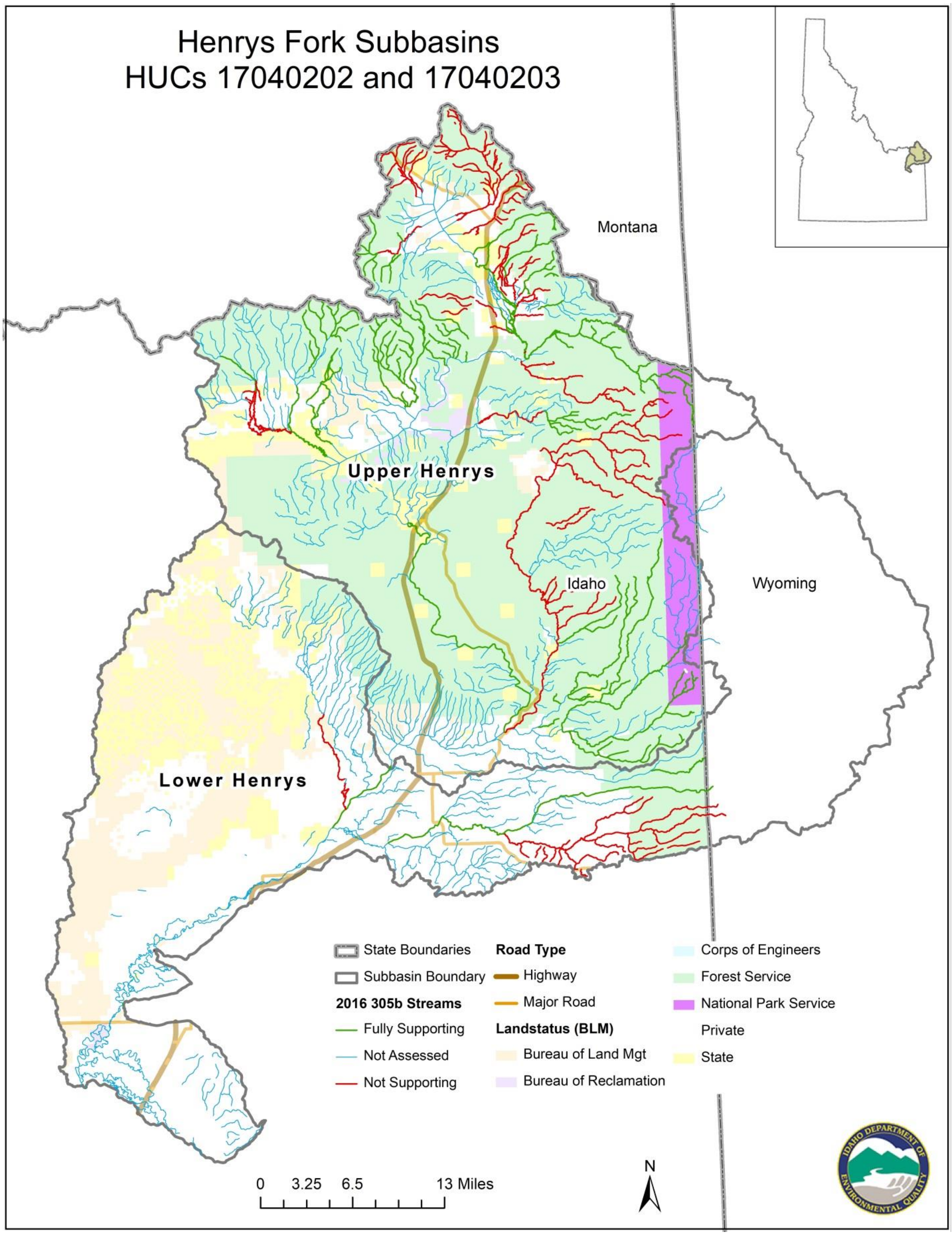

Figure A. Upper and Lower Henrys Fork subbasins.

A 5-year review for the Upper and Lower Henrys Fork subbasins was completed in 2017 (DEQ 2017). That review addressed assessment units (AUs) identified in the 2014 Integrated Report (DEQ, 2018) as having approved total maximum daily loads (TMDLs). This document presents AUs included in Category 5 of the 2014 Integrated Report (DEQ, 2018) that require TMDLs or further documentation.

The Upper Henrys Fork subbasin contains 4 AUs (13 water bodies) that need to be addressed. The AUs are in the northern portion of the subbasin and included in the 2014 Integrated Report list of impaired waters for combined biota/habitat bioassessments or bacteria. The combined biota/habitat bioassessments listing results from a failing score of the Idaho Department of Environmental Quality’s (DEQ) Beneficial Use Reconnaissance Program (BURP) relating to fish population, stream habitat, or macroinvertebrate population. This type of failing BURP score indicates a stream has failed one or more biological-based metrics and further investigation is needed to more accurately determine why the AU did not receive a passing score.

Within the Lower Henrys Fork subbasin, 3 AUs (8 water bodies) required a TMDL or further investigation. Those AUs are also found in the northern portion of that subbasin and were included in the impaired waters list for combined biota/habitat bioassessments.

Waters within these subbasins are designated for protection of cold water aquatic life (COLD) and recreation use in and on the water, but may also include salmonid spawning and domestic water supply. Specific designated beneficial uses for each AU may vary and are further detailed in section 2 of this document.

Key Findings

TMDLs for Twin Creek (ID17040202SK030_02), Timber Creek (ID17040202SK035_03), and Sand Creek (ID17040203SK013_04) were prepared in this document. The Twin Creek AU and Timber Creek AU are within the Upper Henrys Fork subbasin, and the Sand Creek AU is within the Lower Henrys Fork subbasin. The Timber Creek AU was included in Category 5 of the 2016 Integrated Report for bacteria impairment. The Twin Creek and Sand Creek AUs were included in Category 5 of the 2016 Integrated Report for combined biota/habitat bioassessments. Streambank erosion inventories (SEIs) were completed within AUs in the two subbasins to determine if the combined biota/habitat bioassessment listings could be attributed to excess stream sedimentation. DEQ will incorporate additional metrics (FSBI, % fines, etc.) into the next 5 year review. Three SEI locations in the Twin Creek drainage and two SEI locations in the Sand Creek drainage were selected for investigation. In the Twin Creek drainage, two SEI locations were established within lands administered by the United States Forest Service (USFS) in the Caribou-Targhee National Forest (CTNF) and one SEI location was established in lands administered by the Idaho Department of Lands (IDL). The location within IDL’s jurisdiction had excess sedimentation, but the locations within the CTNF did not. In the Sand Creek AU, one SEI location had estimates of stream sediment load greater than the natural background condition; however, this portion of Sand Creek flows through a section of underlying sandy soils that contribute to the measured excess sediment load. Sediment TMDLs were created for those AUs with estimated sediment loads greater than the background condition (Table A).

Table A. Water bodies and pollutants for which sediment and bacteria TMDLs were developed.

Water Body	Assessment Unit Number	Pollutants
	Upper Henrys Fork	
Twin Creek - source to mouth	ID17040202SK030_02	Combined biota/habitat bioassessments
Timber Creek - source to mouth	ID17040202SK035_03	*Escherichia coli*
	Lower Henrys Fork	
Sand Creek - Pine Creek to mouth	ID17040203SK013_04	Combined biota/habitat bioassessments

Table B summarizes assessment outcomes for AUs investigated as part of this TMDL document.

Table B. Summary of assessment outcomes for current §303(d)-listed assessment units.

Assessment Unit Name	Assessment Unit Number	Pollutant	TMDLs Completed	Recommended Changes to Next Integrated Report	Justification
			Upper Henrys Fork		
Moose Creek—source to confluence with Henrys Fork	ID17040202SK022_02	Combined biota/habitat bioassessments	No	Include in Category 2 Delist from Category 5	Improper assessment of low-gradient, soft-bottomed stream with no riffles. Does not qualify in a sampleable category for BURP assessment.
Henrys Lake Outlet—Henrys Lake Dam to mouth	ID17040202SK025_02	Combined biota/habitat bioassessments	No	Retain in Category 5	Mapping error incorrectly associated this AU with portions of the Twin Creek Watershed. AU revision corrected mapping error. No recent data to determine impairment. AU should be reassessed and 5-year review period to confirm use support for newly aligned AU.
Twin Creek—source to mouth	ID17040202SK030_02	Combined biota/habitat bioassessments	Yes	Delist for combined biota/habitat assessments Include in Category 4a for Sedimentation	Sedimentation replaces combined biota/habitat assessments as cause. Sediment TMDL completed based on SEI. TMDL applies only to the portion of this watershed that is outside USFS boundary. The AU correction established lower portions of Twin Creek as a separate AU that were previously included in AU SK025_02 and align stream segments within similar landform and use. AU should be reassessed and 5-year review period to confirm use support for newly aligned AU.
Timber Creek—source to mouth	ID17040202SK035_03	*Escherichia coli*	Yes	Include in Category 4a for *Escherichia coli*	Bacteria TMDL completed based on 30 day geometric mean concentrations.
			Lower Henrys Fork		
Conant Creek—Idaho/Wyoming border to mouth	ID17040203SK007_02	Combined biota/habitat bioassessments	No	Include in Category 3 Delist from Category 5	Improper assessment of intermittent, dewatered, or ephemeral stream. Does not qualify in a sampleable category for BURP assessment.
Conant Creek—Idaho/Wyoming border to mouth	ID17040203SK007_03	Combined biota/habitat bioassessments	No	Include in Category 2 Delist from Category 5	Recent BURP data suggest support of beneficial uses.
Sand Creek—Pine Creek to mouth	ID17040203SK013_04	Combined biota/habitat bioassessments	Yes	Delist for combined biota/habitat assessments Include in Category 4a for sedimentation	Sediment TMDL completed based on SEI. Sedimentation replaces combined biota/habitat assessments as cause.

Several accuracy issues were identified while researching underlying impairment conditions for the AUs in the §303(d)-listed streams within the Upper and Lower Henrys Fork subbasins. The BURP sampling protocol requires stream reaches sampled for beneficial use support to be of the appropriate size and sampleable category and be representative of the entire water body unit (DEQ 2016a). Past mistakes in selecting BURP sites might have caused BURP protocols to be misapplied. Moose Creek (ID17040202SK022_02) is a low-gradient stream with a soft stream bottom that did not have any identified riffles within the reach sampled in the 2004 BURP effort. No riffles within the sample reach would put this stream in a nonsampleable BURP category. Since the BURP protocols have been designed to assess perennial waters within the state, the presence of water is required to foster and maintain aquatic life and to shape the stream's channel.

In the 1st and 2nd order segments of the Conant Creek AU (ID17040203SK007_02), perennial waters have not been found within four different streams over four sampling efforts from the late 1990s to 2014. It may be appropriate to move this AU from an impaired listing to an unassessed category. Water has not been present in this AU since at least the 2006 assessment year. An aquatic community that was present when the initial support assessment was made in 1997 is unlikely to have survived or resemble the community present at that time. Additionally, no water was present at the sampling location in the previous assessment year (1996). In this scenario, it is difficult to determine if any improvements or further degradation to the aquatic community have occurred. Modifying AUs for other reasons may be warranted if the AU crosses different land types or land uses.

An AU may need modification for more accurate representation and clarification of future assessments. AU delineations may be refined as further data are collected on Idaho stream conditions. The Henrys Fork Outlet AUs (ID17040202SK025_02 and ID17040202SK025_02a) contain two clearly distinct land types. Portions of some streams are found in forested hills and the remainder of the stream is found in irrigated valley bottoms with modified flow regimes and channels within private land holdings. Sampling in one land type is not representative of conditions that may be found in the other. Additionally, there was a mapping error that included portions of Twin Creek, which has been designated in Idaho Water Quality Standards as US-30, Twin Creek - source to mouth. Within this AU, Sawtell Creek was assessed for beneficial use support in 2014 and was not supporting its beneficial uses in part through a low macroinvertebrate index score. Similar macroinvertebrate communities would not likely be found in the modified channels and stream flows in the valley bottoms. An AU split was made for this AU to more accurately assess stream conditions and to correct observed water body unit mapping errors. Additionally, the Twin Creek AU (ID17040202SK030_02) shows differing stream characteristics based on land use and ownership. Twin Creek previously encompassed multiple AUs, which compounds the difficulty in assessing it. The AU revision addressed this issue by moving the Twin Creek watershed into a single water body unit that has similar beneficial uses.

Within the Henrys Fork valley bottom, Twin Creek changed AU designation from the Twin Creek AU to the Henrys Lake Outlet AU. Based on evidence and empirical observations, the previous AU split was inappropriate. Data collected within the forested portions of Twin Creek does not accurately represent conditions within the valley bottoms and vice versa. The circumstances observed for both the Twin Creek and Henrys Lake Outlet AUs are similar and were addressed by reorganizing the AUs. The reorganization assigned stream segments based on land ownership boundaries, ultimately grouping the stream segments by waterbody identifications, land form, and land use as prescribed within DEQ's *Water Body Assessment Guidance* (DEQ 2016b) and corrected the observed water body unit mapping errors.

Previously, the Henrys Lake Outlet AU contained water bodies found in the Henrys Fork valley bottom and surrounding hills including portions of Twin Creek and were split at the CTNF boundaries found within the Upper Henrys subbasin. Additionally, the Twin Creek AU contained the headwater portions of Twin Creek to approximately the CTNF boundary where the AU designation changed to the Henrys Lake Outlet AU. The Henrys Lake Outlet AU was split at the CTNF boundaries in the subbasin to create a Henrys Lake Outlet - USFS boundary to mouth AU (ID17040202SK025_02) and a Henrys Lake Outlet - Henrys Lake Dam to USFS boundary AU (ID17040202SK025_02a). Furthermore, the portions of Twin Creek previously included in the Henrys Lake Outlet AU were removed from that AU. The Twin Creek watershed was also split into two AUs similar to the Henrys Lake Outlet split. The Twin Creek AU was split at the CTNF boundary to create a Twin Creek - USFS boundary to mouth AU (ID17040202SK030_02) and a Twin Creek - source to USFS boundary AU (ID17040202SK030_02a). Table C presents the previous and current AU alignments within the Upper Henrys Fork subbasin. Figure B and Figure C detail the previous AU alignment and the current AU realignment based on land type and land use. A TMDL for the newly recognized Twin Creek - USFS boundary to mouth AU has been calculated. Section 2.3.2, Assessment Unit Summary, contains further details about the previous and current AU alignment.

Table C. Previous and Current AU re-alignment in Upper Henrys Fork subbasin

Assessment Unit Name	Assessment Unit Number	Pollutant	TMDLs Completed	Recommended Changes to Next Integrated Report	Justification
Previous AU Alignment					
Henrys Lake Outlet—Henrys Lake Dam to mouth	ID17040202SK025_02	Combined biota/habitat bioassessments	No	Retain in Category 5	Mapping error incorrectly associated this AU with portions of the Twin Creek Watershed. AU revision corrected the mapping error
Twin Creek—source to mouth	ID17040202SK030_02	Combined biota/habitat bioassessments	Yes	Delist for combined biota/habitat assessments Include in Category 4a for Sedimentation	Sediment TMDL completed based on SEI. Sedimentation replaces combined biota/habitat assessments as cause. TMDL applies only to the portion of this watershed that is outside USFS boundary. The AU correction established lower portions of Twin Creek as a separate AU that were previously included in AU SK025_02 and align stream segments within similar landform and use. AU should be reassessed and 5-year review period to confirm use support for newly aligned AU.
Current AU Alignment					
Henrys Lake Outlet—USFS boundary to mouth	ID17040202SK025_02	Combined biota/habitat bioassessments	No	Retain in Category 5	AU split to align stream segments within similar landform and use. Valley bottom streams appear to be hydrologically modified and require additional assessments. No recent data to determine impairment. AU should be reassessed and 5-year review period to confirm use support for newly aligned AU.
Henrys Lake Outlet – Henrys Lake Dam to USFS boundary	ID17040202SK025_02a		No	Include in Category 5 for combined biota/habitat assessments	Failing 2014 BURP score indicates designated beneficial uses of cold water aquatic life and salmonid spawning are not being supported.

Twin Creek—USFS boundary to mouth	ID17040202SK030_02	Combined biota/habitat bioassessments	Yes	Delist from Category 5 Delist for combined biota/habitat assessments Include in Category 4a for Sedimentation	AU split to align stream segments within similar landform and land use. Sediment TMDL completed based on SEI. Sedimentation replaces combined biota/habitat assessments as cause. The AU correction l established lower portions of Twin Creek as a separate AU that were previously included in AU SK025_02
Twin Creek -- source to USFS boundary	ID17040202SK030_02a		No	Include in Category 2	BURP scores in AU from 2014 and 2019 indicate full support of cold water aquatic life use. Portion of Twin Creek AU within USFS Boundaries

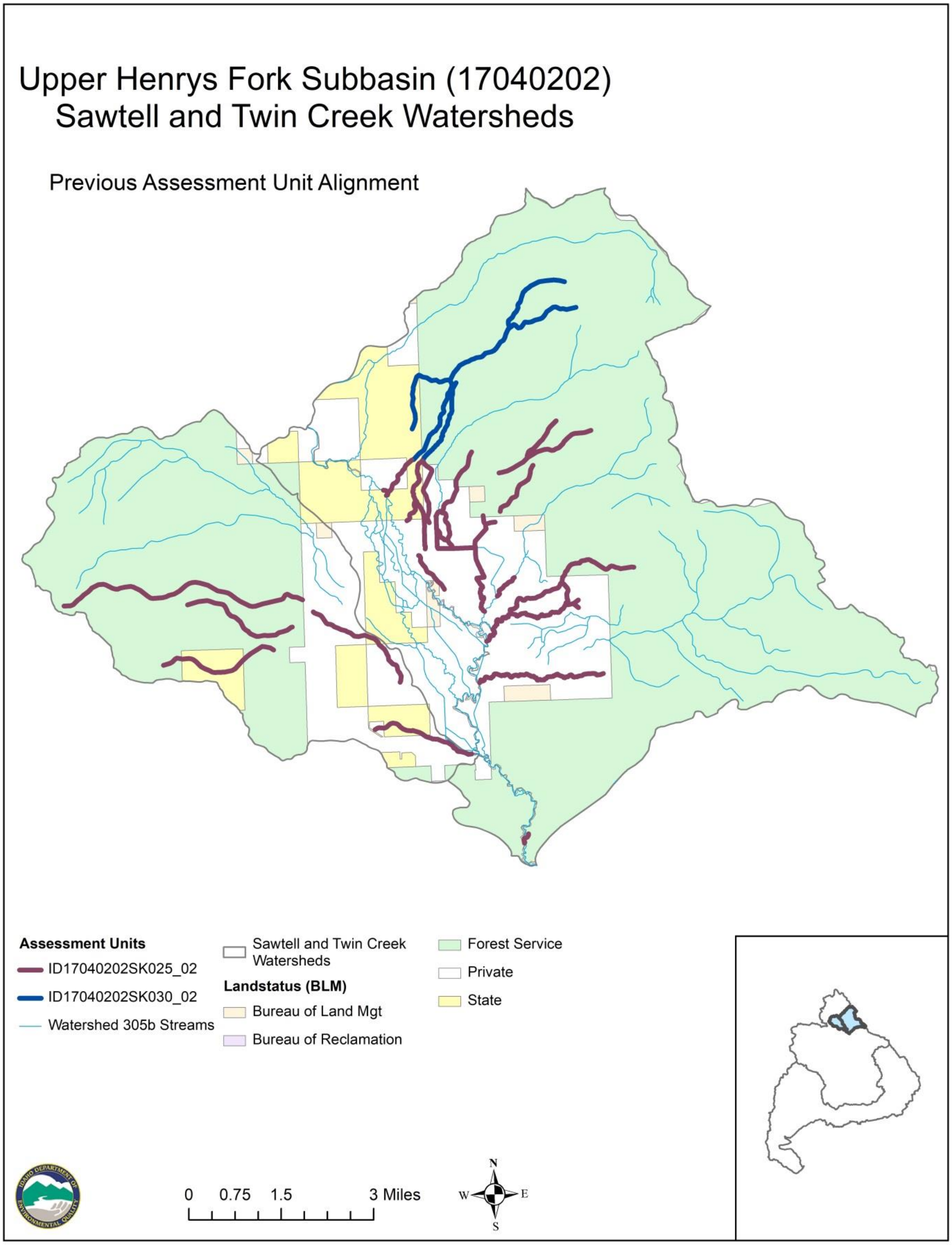

Figure B. Previous Henrys Lake Outlet AU and Twin Creek AU alignment.

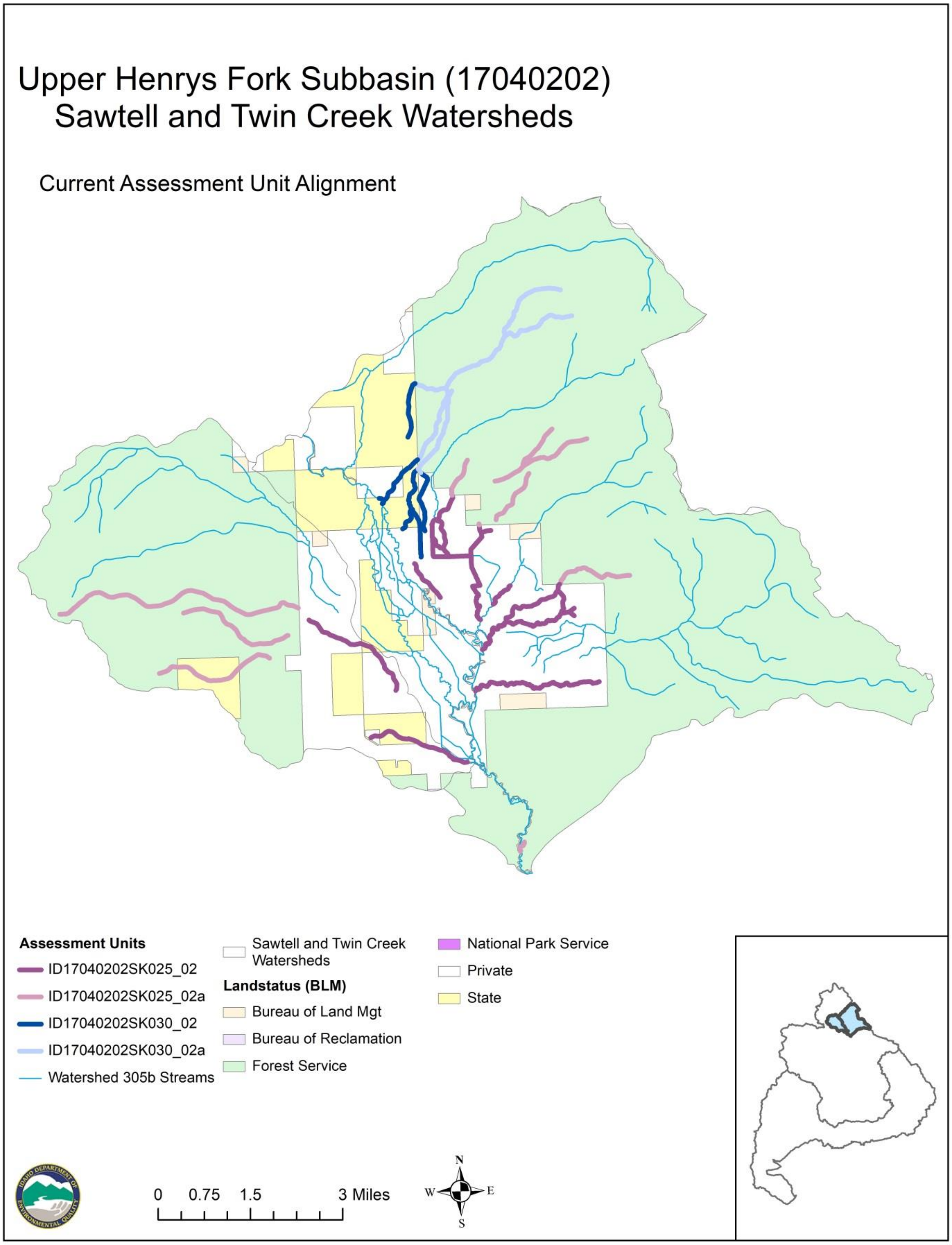

Figure C. Current Henrys Lake Outlet AU and Twin Creek AU realignment.

Public Participation

DEQ works with Henrys Fork Watershed Council to ensure wide distribution of TMDL documents. The HFWC acts as a WAG for HUCs in the Henrys Fork and Teton basins, often asking local volunteers to be involved early with in the TMDL process and then a full presentation and vote on the TMDL public comment period follows after the TMDL is developed and existing TMDLs updated. DEQ. USFS, BLM, producers, irrigators and local non-profit groups make up the working groups during the TMDL development. The final TMDL was presented to the HFWC on March 12, 2019.

And the public comment period ran May 13 – June 11, 2020. Comments were received from EPA, but other stakeholders input was incorporated prior to PC's start.

Introduction

This document addresses 7 assessment units (AUs) in the Upper and Lower Henrys Fork subbasins that have been placed in Category 5 of Idaho's most recent federally approved Integrated Report (DEQ, 2018). Of those AUs, 3 AUs (3 water bodies) will be addressed with a total maximum daily load (TMDL). The purpose of this TMDL is to characterize and document pollutant loads within the Upper and Lower Henrys Fork subbasins. The first portion of this document presents key characteristics or updated information for the subbasin assessment, which is divided into four major sections: subbasin characterization (section 1), water quality concerns and status (section 2), pollutant source inventory (section 3), and a summary of past and present pollution control efforts (section 4). While the subbasin assessment is not a requirement of the TMDL, the Idaho Department of Environmental Quality (DEQ) performs the assessment to ensure impairment listings are up to date and accurate.

The subbasin assessment is used to develop a TMDL for each pollutant of concern for the Upper and Lower Henrys Fork subbasins. The TMDL (section 5) is a plan to improve water quality by limiting pollutant loads. Specifically, a TMDL is an estimation of the maximum pollutant amount that can be present in a water body and still allow that water body to meet water quality standards (40 CFR Part 130). Consequently, a TMDL is water body- and pollutant-specific. The TMDL also allocates allowable discharges of individual pollutants among the various sources discharging the pollutant.

Regulatory Requirements

This document was prepared in compliance with both federal and state regulatory requirements. The federal government, through the United States Environmental Protection Agency (EPA), assumed the dominant role in defining and directing water pollution control programs across the country. DEQ implements the Clean Water Act in Idaho, while EPA oversees Idaho and certifies the fulfillment of Clean Water Act requirements and responsibilities.

Congress passed the Federal Water Pollution Control Act, more commonly called the Clean Water Act, in 1972. The goal of this act was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 USC §1251). The act and the programs it has generated have changed over the years as experience and perceptions of water quality have changed. The Clean Water Act has been amended 15 times, most significantly in 1977, 1981, and 1987. One of the goals of the 1977 amendment was protecting and managing waters to ensure "swimmable and fishable" conditions. These goals relate water quality to more than just chemistry.

The Clean Water Act requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters. States and tribes, pursuant to Section 303 of the Clean Water Act, are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the nation's waters whenever possible. DEQ must review those standards every 3 years, and EPA must approve Idaho's water quality standards. Idaho adopts water quality standards to protect public health and welfare, enhance water quality, and protect biological integrity. A water quality standard defines the goals of a water body by designating the use or uses for the water, setting criteria necessary to protect those uses, and preventing degradation of water quality through antidegradation provisions.

Section 303(d) of the Clean Water Act establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list (a "§303(d) list") of impaired waters. Currently, this list is published every 2 years as the list of Category 5 waters in Idaho's Integrated Report. For waters identified on this list, states and tribes must develop a TMDL for the pollutants set at a level to achieve water quality standards.

DEQ monitors waters, and for those not meeting water quality standards, DEQ must establish a TMDL for each pollutant impairing the waters. However, some conditions that impair water quality do not require TMDLs. EPA considers certain unnatural conditions—such as flow alteration, human-caused lack of flow, or habitat alteration—that are not the result of discharging a specific pollutant as "pollution." TMDLs are not required for water bodies impaired by pollution, rather than a specific pollutant. A TMDL is only required when a pollutant can be identified and in some way quantified.

1 Subbasin Characterization

The Upper Henrys Fork (hydrologic unit code [HUC] 17040202) and Lower Henrys Fork (HUC 17040203) subbasins are located in Idaho and Wyoming, with portions of both in Yellowstone National Park (Figure 1). The majority of these subbasins are located on public lands. The United States Forest Service (USFS) is the largest land management agency in the subbasins, managing approximately 45% of the total area. The easternmost portion of the subbasin lies within Wyoming; however, 97% of the total acreage of the Upper Henrys Fork and 70% of the Lower Henrys Fork is in Idaho. The total area for the Upper Henrys Fork subbasin is 701,567 acres while the Lower Henrys Fork is 720,598 acres.

Historically, the economy of the region has been based on livestock grazing, timber production, and cultivated agriculture. Two reservoirs provide storage for irrigated agricultural lands both inside and outside the bounds of the subbasins: Henrys Lake and Island Park. The Henrys Fork fishery has an international reputation among fly fishers, and anglers drawn to the area are becoming increasingly important to the local economy. Coldwater salmonid fisheries are found within both subbasins, and many of the streams are active recreation sites (DEQ 2010a).

Elevation ranges from over 10,000 feet along the Centennial Mountains on the north side of the subbasins to 4,800 feet near the Henrys Fork confluence with the Snake River to the south. The average elevation in the subbasins is 6,700 feet above sea level (Whitehead 1978).

Precipitation in the subbasins varies with elevation, with annual averages of 43 inches near the headwaters and 14 inches near the confluence with the Snake River. The minimum annual average temperatures range from 22 ºFahrenheit (F) (-6 °Celsius [C]) near the headwaters to 30 ºF (1 °C) at the confluence. Maximum average annual temperatures range from 52 ºF (11 °C) at the headwaters and 57 ºF (14 °C) at the confluence (BOR 2015). Vegetation cover includes mixed conifer, subalpine fir, lodgepole pine, and grass/shrub types. Geologically, the subbasins are composed of Pre-Cambrian metamorphic rocks, Mesozoic and Paleozoic sedimentary rocks, glacial deposits, and a variety of volcanic deposits (Good and Pierce 1996).

Population density within both subbasins is generally low. Fremont County, which covers the majority of both subbasins, averages only seven people per square mile. Within the upper subbasin, population centers are Island Park, Warm River, and the Henrys Lake area. A large and growing population of rural summer residents is concentrated in the Henrys Lake and Island Park regions. In the lower subbasin, permanent residents provide a greater presence due to the agricultural capacity of the Snake River plain. The main population centers are St. Anthony and Ashton, both of which are ranching and agricultural communities of 3,542 and 1,127 people, respectively (U.S. Census Bureau 2010).

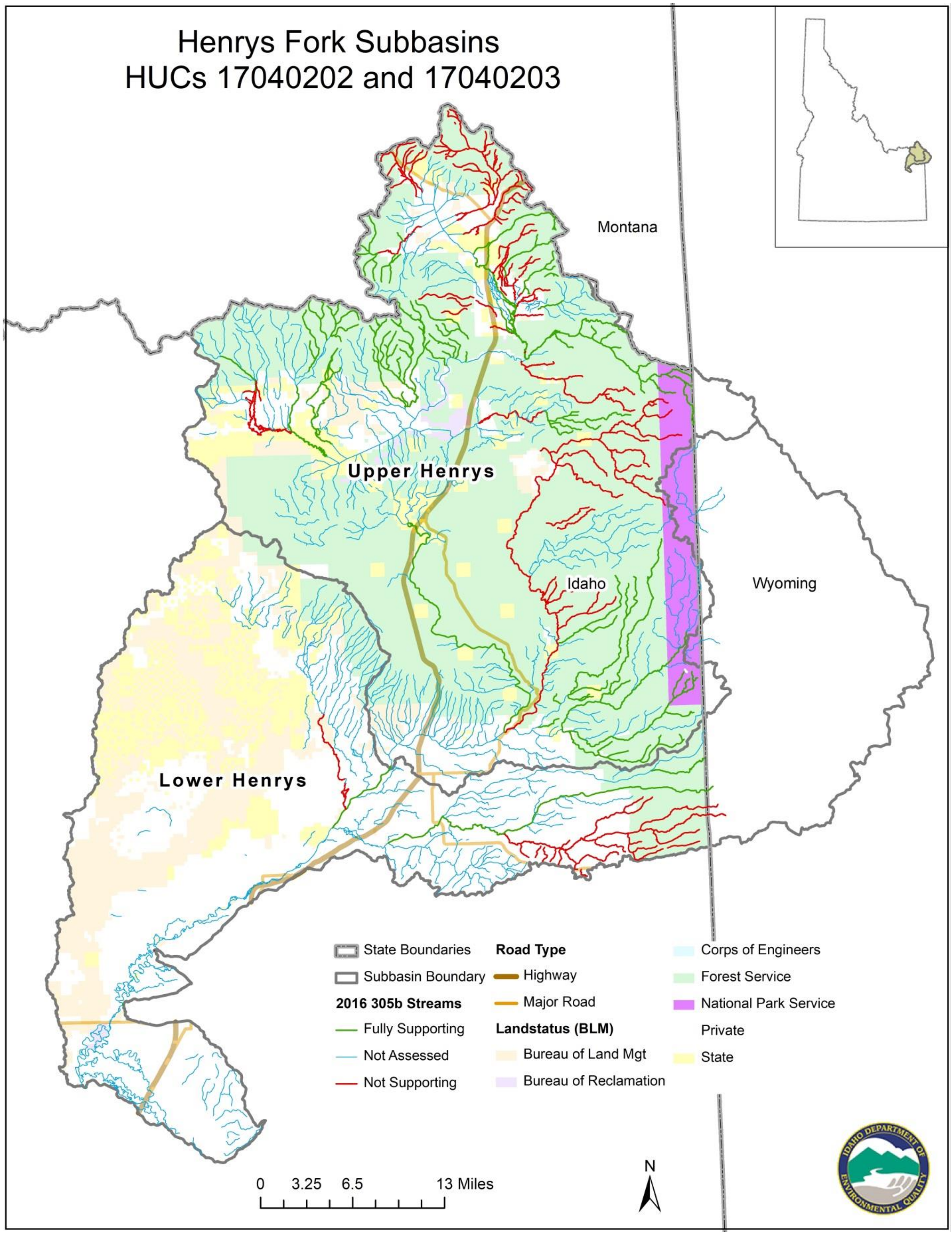

Figure 1. Upper and Lower Henrys Fork subbasin TMDL waters.

2 Water Quality Concerns and Status

2.1 Water Quality Limited Assessment Units Occurring in the Subbasins

Section 303(d) of the Clean Water Act states that waters that are unable to support their beneficial uses and do not meet water quality standards must be listed as water quality limited. Subsequently, these waters are required to have TMDLs developed to bring them into compliance with water quality standards.

2.1.1 Assessment Units

AUs are groups of similar streams that have similar land use practices, ownership, or land management. However, stream order is the main basis for determining AUs—even if ownership and land use change significantly, the AU usually remains the same for the same stream order.

Using AUs to describe water bodies offers many benefits; primarily that all waters of the state are defined consistently. AUs are a subset of water body identification numbers, which allows them to relate directly to the water quality standards.

2.1.2 Listed Waters

Table 1 shows the pollutants listed for each §303(d)-listed AU in the subbasin (i.e., AUs in Category 5 of the Integrated Report).

Table 1. Upper and Lower Henrys Fork subbasin §303(d)-listed assessment units in the subbasins.

Assessment Unit Name	Assessment Unit Number	Listed Pollutants
Upper Henrys Fork		
Moose Creek—source to confluence with Henrys Fork	ID17040202SK022_02	Combined biota/habitat bioassessments
Henrys Lake Outlet—Henrys Lake Dam to mouth	ID17040202SK025_02	Combined biota/habitat bioassessments
Twin Creek—source to mouth	ID17040202SK030_02	Combined biota/habitat bioassessments
Timber Creek—source to mouth	ID17040202SK035_03	*Escherichia coli*
Lower Henrys Fork		
Conant Creek—Idaho/Wyoming border to mouth	ID17040203SK007_02	Combined biota/habitat bioassessments
Conant Creek—Idaho/Wyoming border to mouth	ID17040203SK007_03	Combined biota/habitat bioassessments
Sand Creek—Pine Creek to mouth	ID17040203SK013_04	Combined biota/habitat bioassessments

2.2 Applicable Water Quality Standards and Beneficial Uses

Idaho water quality standards (IDAPA 58.01.02) list beneficial uses and set water quality goals for waters of the state. Idaho water quality standards require that surface waters of the state be protected for beneficial uses, wherever attainable (IDAPA 58.01.02.050.02). These beneficial uses are interpreted as existing uses, designated uses, and presumed uses as described briefly in Appendix A. The *Water Body Assessment Guidance* (DEQ 2016b) provides a more detailed description of beneficial use identification for use assessment purposes.

Beneficial uses include the following:

- Aquatic life support—cold water, seasonal cold water, warm water, salmonid spawning, and modified
- Contact recreation—primary (e.g., swimming) or secondary (e.g., boating)
- Water supply—domestic, agricultural, and industrial
- Wildlife habitats
- Aesthetics

2.2.1 Beneficial Uses in the Subbasins

In the Henrys Fork subbasins, the Henrys Fork itself is designated for cold water aquatic life, salmonid spawning, primary contact recreation, and domestic water supply. Smaller undesignated tributaries are presumed by Idaho water quality standards to support cold water aquatic life and primary or secondary contact recreation (IDAPA 58.01.02). Table 2 provides the beneficial uses for §303(d)-listed streams. Many of the streams in the subbasins are known to contain viable populations of salmonids and have salmonid spawning as an existing use. The selection of primary or secondary contact recreation in undesignated waters is based on the actual observation or absence of actual observation of primary contact recreation activities. Generally, a water depth of at least 2 feet indicates that ingestion of water during swimming or other primary contact recreation activities is possible and that primary contact recreation should be the assumed recreation category (DEQ 2016b). Evidence of primary contact recreation is not known for the undesignated waters presented in Table 2. Available Beneficial Use Reconnaissance Program (BURP) data were used to determine water depths and the most appropriate recreation category. From that data search, the 3rd order section of Conant Creek is the only AU with data that indicate the stream may be greater than 2 feet deep.

Table 2. Upper and Lower Henrys Fork subbasin beneficial uses of §303(d)-listed streams.

Assessment Unit Name	Assessment Unit Number	Beneficial Uses[a]	Type of Use
	Upper Henrys Fork		
Moose Creek—source to confluence with Henrys Fork	ID17040202SK022_02	COLD, SCR	Presumed
Henrys Lake Outlet—Henrys Lake Dam to mouth	ID17040202SK025_02	COLD, SS, PCR, DWS	Designated
Twin Creek—source to mouth	ID17040202SK030_02	COLD, SCR	Presumed
Timber Creek—source to mouth	ID17040202SK035_03	COLD, SCR	Presumed
	Lower Henrys Fork		
Conant Creek—Idaho/Wyoming border to mouth	ID17040203SK007_02	COLD, SCR	Existing
Conant Creek—Idaho/Wyoming border to mouth	ID17040203SK007_03	COLD, PCR	Existing
Sand Creek—Pine Creek to mouth	ID17040203SK013_04	COLD, SCR	Presumed

[a] Cold water aquatic life (COLD), salmonid spawning (SS), primary contact recreation (PCR), secondary contact recreation (SCR), domestic water supply (DWS)

2.2.2 Water Quality Criteria to Support Beneficial Uses

Beneficial uses are protected by a set of water quality criteria, which include *numeric* criteria for pollutants such as bacteria, dissolved oxygen, pH, ammonia, temperature, and turbidity (Appendix B), and *narrative* criteria for pollutants such as sediment and nutrients (IDAPA 58.01.02.250–251).

Narrative criteria for excess sediment are described in the water quality standards:

> Sediment shall not exceed quantities specified in Sections 250 and 252, or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Subsection 350. (IDAPA 58.01.02.200.08)

DEQ's procedure to determine whether a water body fully supports designated and existing beneficial uses is outlined in IDAPA 58.01.02.050.02. The procedure relies heavily upon biological parameters and is presented in detail in the *Water Body Assessment Guidance*

(DEQ 2016b). This guidance requires DEQ to use the most complete data available to make beneficial use support status determinations.

2.3 Summary and Analysis of Existing Water Quality Data

Additional data collected in AUs contained in Category 5 of the 2016 Integrated Report are summarized below. The data have been used to inform proposed changes to AUs and listing categories for the 2018-2020 Integrated Report. Most of the data collection activities were completed in 2015 to more clearly identify impairment causes of Category 5 AUs. Nine streambank erosion inventories (SEIs) were conducted in the following 4 AUs listed for combined biota/habitat bioassessments:

- Moose Creek (ID17040202SK022_02)
- Twin Creek (ID17040202SK030_02)
- Conant Creek (ID 17040203SK007_03)
- Sand Creek (ID17040203SK013_04)

Timber Creek (ID17040202SK035_03) was included in Category 5 for *Escherichia coli* (*E. coli*), and the most recent data available from which to calculate an appropriate and required 30 day geometric mean was collected in 2003. Data were collected in 2015 to determine if bacteria were a continuing impairment. Four samples collected from this AU in late August 2015 were found to be comparable to values measured in 2003. The 2015 data is insufficient to accurately assess representative bacteria concentrations in the AU.

SEI data collected for the Moose Creek AU was completed at two sampling locations. Data suggest there is no current stream load resulting from streambank erosion as the stream load does not exceed the stream’s load capacity based on a background level of 80% stable streambank.

Streams within the Twin Creek watershed were previously split between two different waterbody IDs and AUs. The lower portions of the stream were in the 1st and 2nd order portion of Henrys Lake Outlet, and the upper portions are found in the Twin Creek AU. The updated AU fixed a mapping error and split the AU near a land management agency boundary and reflects differing land use patterns and corrects an error in water body unit mapping. Three SEIs were completed in what is currently designated as the Twin Creek AU. Two SEIs completed within the forested portion of the stream (SK030_02a) indicate no excessive streambank erosion, and a 2014 BURP site further upstream also indicates no impairment of aquatic life. The third SEI completed for the Twin Creek AU (SK030_02) is within the valley bottom meadow indicates a streambank erosion reduction of approximately 7 tons per year is needed to meet natural background erosion rates.

In addition to the mapping error correction for the Twin Creek AU’s the Henry’s Lake Outlet AU was split based on land use. The previous Henry’s Lake Outlet AU is now comprised of two AUs that represent portion of the outside the forest service boundary (SK025_02) or inside the forest service boundary (SK025_02a). Due to the split and current alignment of Henrys Lake Outlet – USFS to mouth – ID17040202SK025_02, there is no recent data to assess impairment. This AU will need to be reassessed in the future.

1st and 2nd order portions of Conant Creek are usually dry and no recent data has been able to be collected from streams in this AU. The two SEIs completed for the 3rd order portions of Conant Creek suggest this AU requires no sediment load reduction. Sand Creek SEI data were collected from upper portions of the AU, with an excess sediment load identified in an upstream location near the Lower Arcadia Reservoir.

Figure 2 presents AUs in the Upper and Lower Henrys Fork subbasins that have had TMDLs developed. The TMDL for the Twin Creek AU in the valley bottoms represents the estimated sediment load of the newly aligned AU (Figure 3).

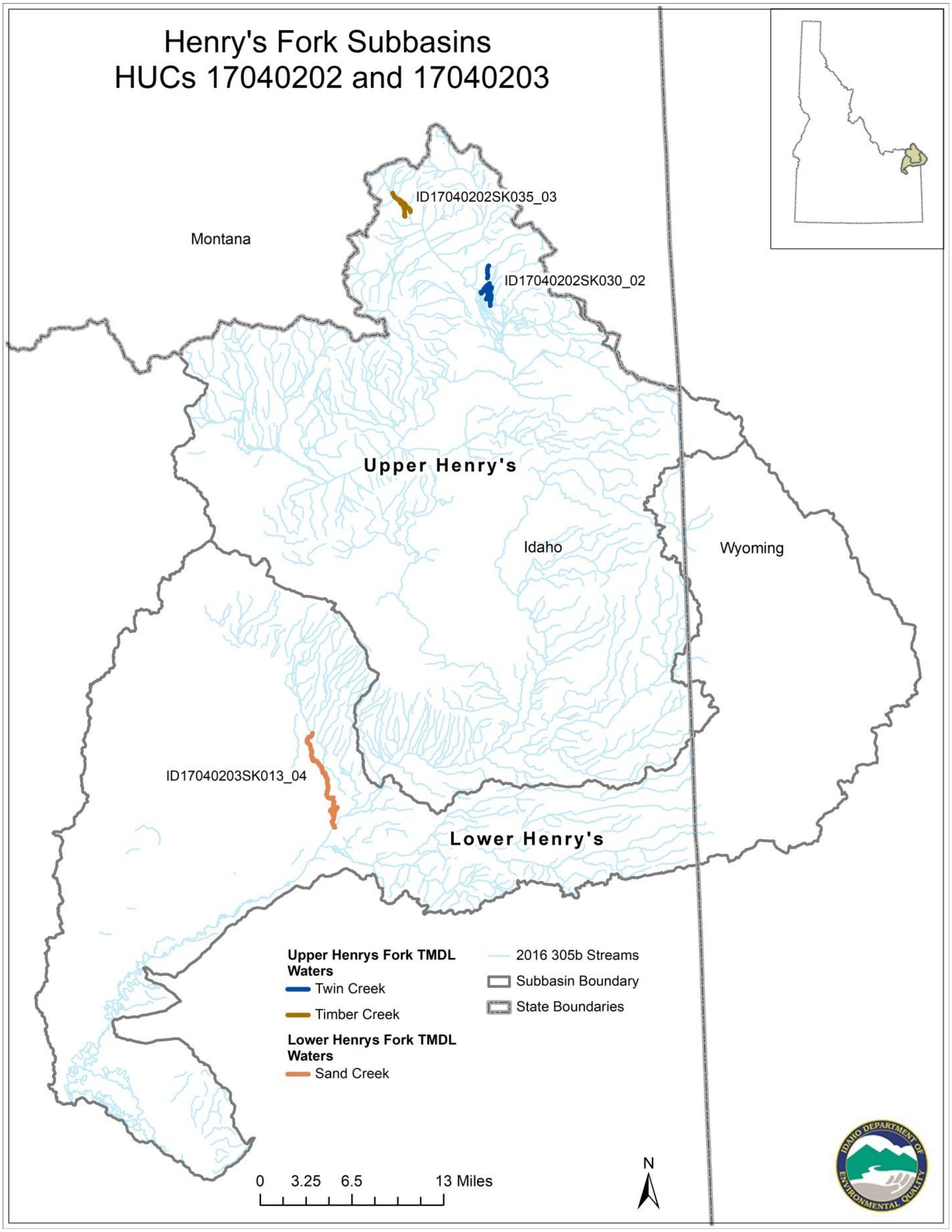

Figure 2. Assessment units in Upper and Lower Henrys Fork subbasins with TMDLs

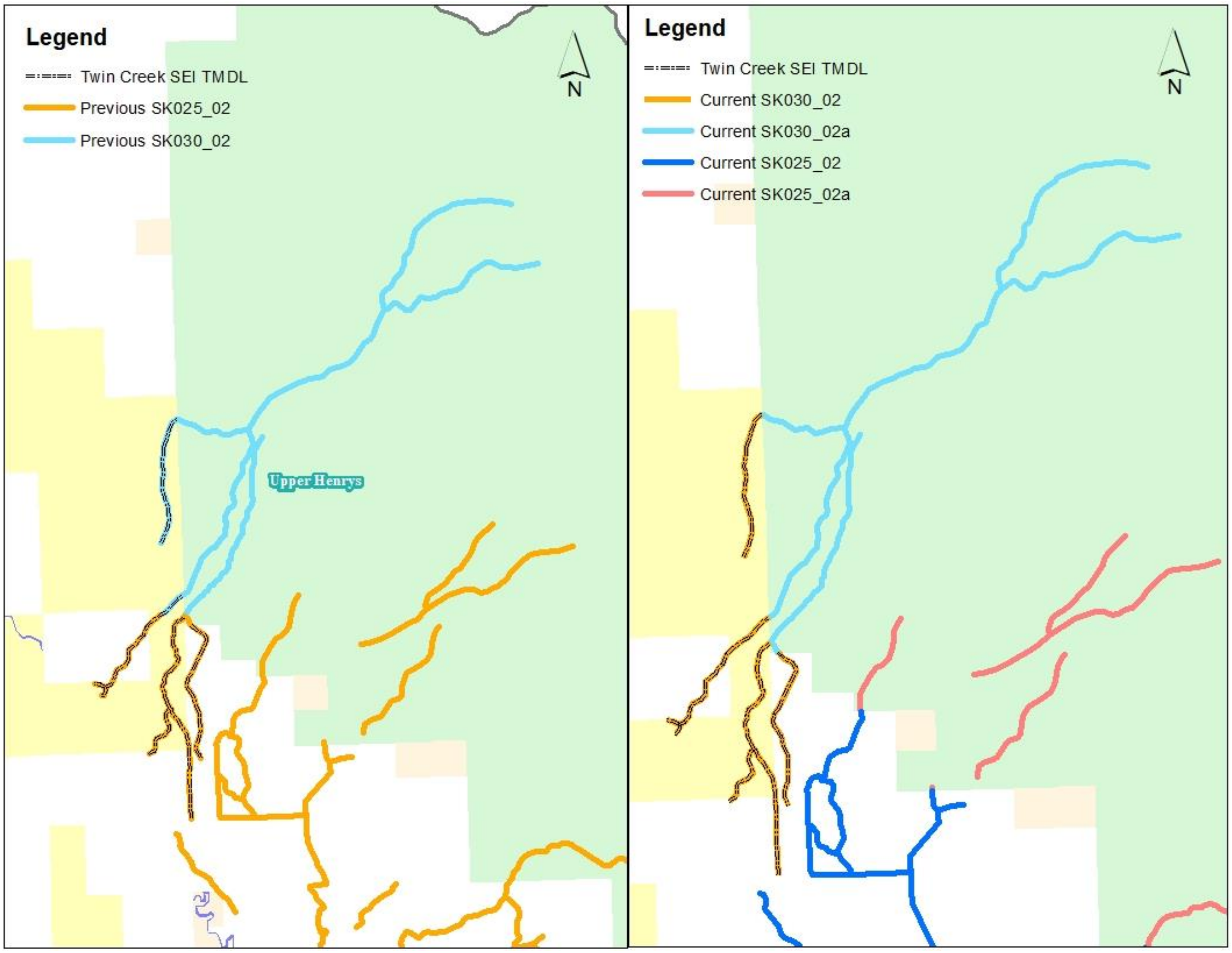

Figure 3. Twin Creek SEI TMDL extent with previous and current AU alignment for Twin Creek and Henrys Lake Outlet AUs.

2.3.1 Status of Beneficial Uses

Within this document, TMDLs for sedimentation/siltation have been calculated for the Twin Creek AU in the Upper Henrys Fork subbasin and the 4th order of Sand Creek within the Lower Henrys Fork subbasin. Excess sedimentation can alter pool abundance and depth, negatively impacting primary productivity and macroinvertebrate communities (Beechie et al. 2005). Increased fine sedimentation and suspended sediment load can degrade water quality and impair the visibility of prey items for predatory species. Fine sediment deposition can fill spaces between stream gravels and reduce the survivability of incubating salmonid eggs (Beechie et al. 2005).

Pollutants impacting beneficial uses have not yet been clearly identified for most of the other AUs included in Category 5 of the 2016 Integrated Report within the Upper and Lower Henrys Fork subbasins. Several factors may be contributing to the lack of clarity, but 2015 SEI data indicate that sediment impairment is not usually the cause. BURP data collected in the subbasins also do not suggest that nutrient enrichment or metals contamination are causes of impairment. Within some AUs, temperature impairment may be present, but data are not yet available to assess the likelihood of this impairment or if the investigation of temperature impairment is warranted.

2.3.2 Assessment Unit Summary

A summary of the data analysis, literature review, and field investigations and a list of conclusions for AUs included in Category 5 of the 2016 Integrated Report follows. This section includes changes that will be documented in the next Integrated Report once the TMDLs in this document have been approved by EPA.

2.3.2.1 Assessment Units Addressed in TMDLs

ID17040202SK030_02, **Twin Creek—USFS boundary to mouth**

- Listed for combined biota/habitat bioassessments.
- Low index scores for macroinvertebrate and fish communities assessed in 2006 from data collected in 2004. BURP data collected in 1996 and 2014 indicated scores fully supporting beneficial uses.
- The Twin Creek drainage occupies two distinct land forms and land use types. Headwater portions of this drainage are found in forested hills, while lower reaches are found in open meadows and irrigated pastures. Data collected from forested, headwater stream reaches are not representative of the stream reaches found in valley bottom meadows. Land use management is also distinctly different. Headwater reaches are managed by the USFS, while valley bottom meadows are held as private land or are state parcels that have a different use mandate compared to the USFS lands. Streams in the valley bottom meadows can be seen from aerial imagery to be highly modified channels or may not be hydrologically connected to upgradient systems. It is more representative to define the Twin Creek - USFS boundary to mouth AU (ID17040202SK030_02) as those streams or channels found in the valley bottom and the headwater portion of Twin Creek as Twin Creek – Source to USFS Boundary (ID17040202SK03_02a)This would more closely align streams in the drainage with their land type and use and also correct a water body unit mapping error within Idaho WQS. The lower portions of the Twin Creek watershed that are in the valley bottom and were previously in the Henrys Lake Outlet AU were removed from that AU and placed in the Twin Creek - USFS boundary to mouth AU. The previous AU alignment and the AU realignment are shown in Figure 4 and Figure 5. The existing USFS boundary appeared as a straightforward means to identify where to make the necessary AU splits. A TMDL for the Twin Creek - USFS boundary to mouth AU has been calculated that is only applicable to portions of Twin Creek outside of the USFS boundary (Figure 5). Recently collected SEI data has indicated that upper Twin Creek is not supplying excess sediment. Recent BURP data indicates full support of aquatic life in upper Twin Creek.

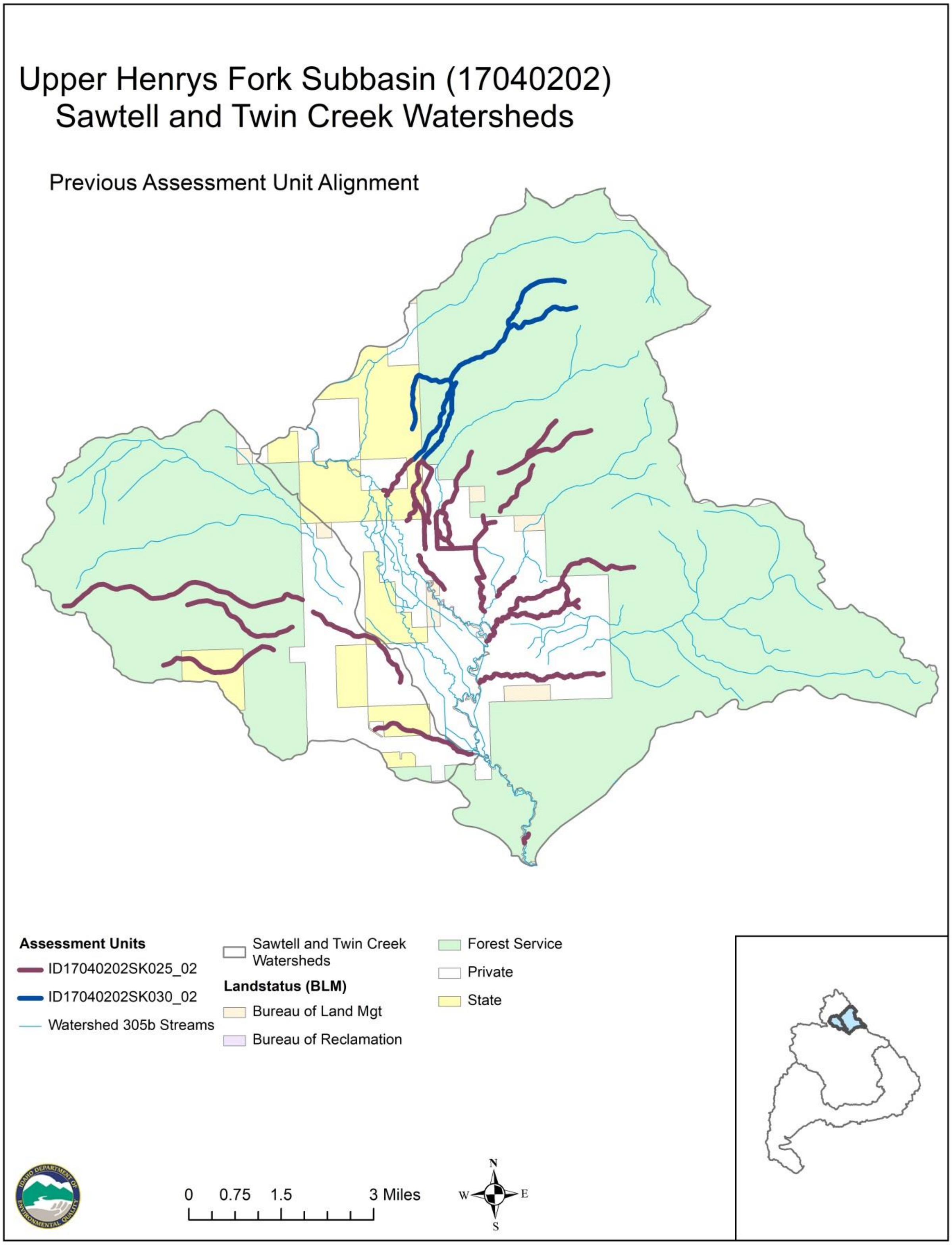

Figure 4. Previous Henrys Lake Outlet AU and Twin Creek AU alignment.

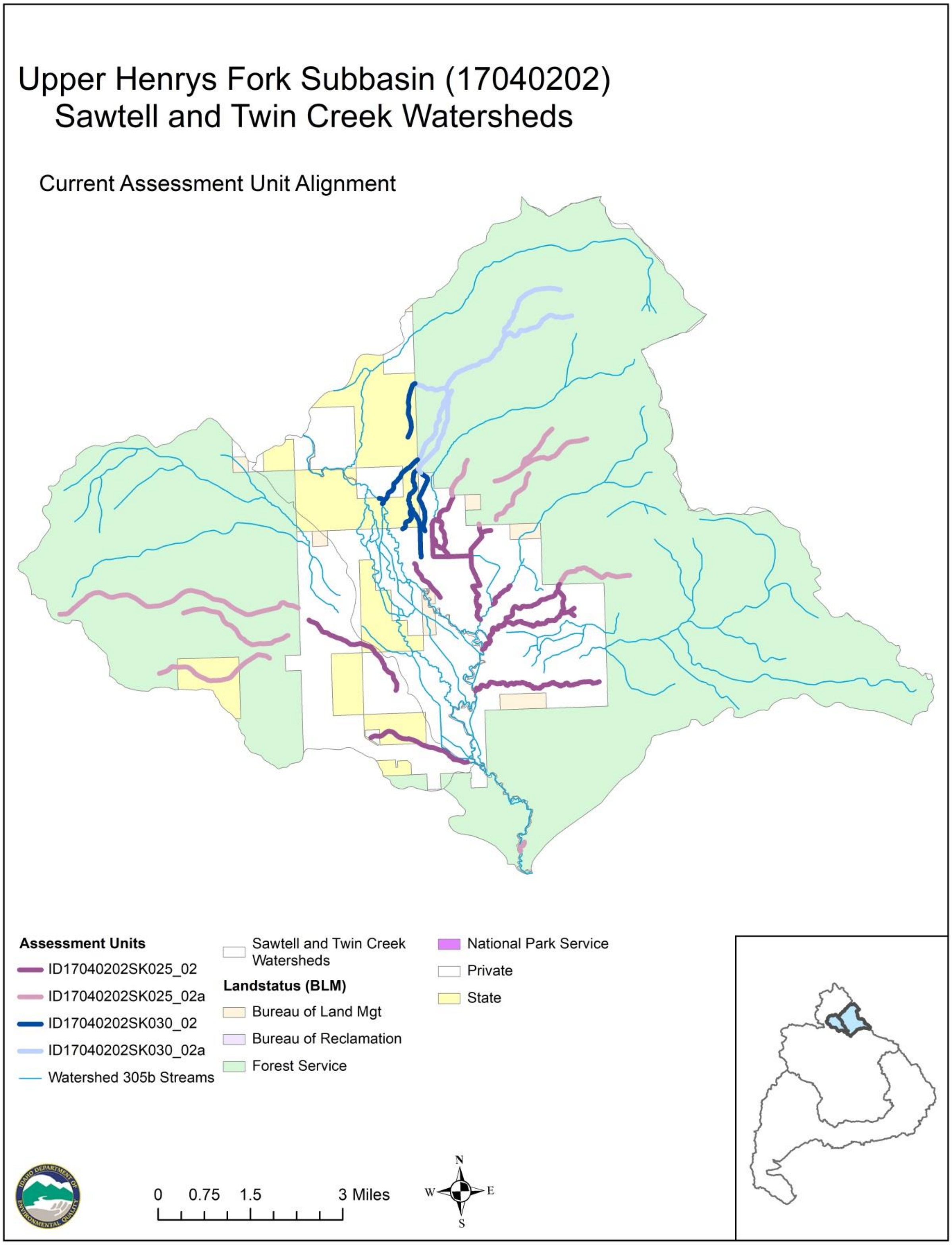

Figure 5. Current Henrys Lake Outlet AU and Twin Creek AU realignment.

ID17040203SK013_04, Sand Creek—Pine Creek to mouth

- Listed for combined biota/habitat bioassessment.
- SEI data were collected in 2015 at two locations within the upper portion of this AU: one near a 2004 BURP site at the Sadorus Hill Road and the other further upstream below the Lower Arcadia Reservoir. The lower SEI and 2004 BURP data indicate no impairment from excessive streambank erosion with no load reduction needed and streambanks categorized as stable and covered. The upper SEI location indicated that a load reduction of up to 15 tons per year was needed.

ID17040202SK035_03, Timber Creek—source to mouth

- Listed for *E. coli*.
- *E. coli* was listed as the impairment and added to Category 5 for nonsupport of secondary contact recreation in 2010.
- The Timber Creek AU was listed in 2010 for bacteria impairment, 2003 water samples indicated an exceedance of DEQ's surface water standard for *E. coli* and was not listed on subsequent IRs until the 2010 IR cycle, nor was this AU addressed in TMDL addendums or five-year reviews in the time following the initial water sample collections. *E. coli* concentrations measured in 2003 resulted in a geometric mean value of 338 colony forming units (cfu) per 100 milliliters (mL) of water verifying the *E. coli impairment*. As a TMDL was not established for this AU in previous documentation, a TMDL for *E. coli* has been calculated in this document. Water samples collected for bacteria analysis in 2015 did not have concentrations greater than the single sample maximum of 576 cfu/100 mL of water. Four individual samples were collected and analyzed in 2015, and the maximum *E. coli* concentration was 214 cfu/100 mL. The *E. coli* concentrations measured in 2015 do not indicate violations of the single sample value criterion in the Water Quality Standards; however, an inadequate number of samples in the appropriate timeframe were collected to compare the *E. coli* concentrations against the geometric mean criterion. This AU should be moved to Category 4a upon approval of the TMDL.

2.3.2.2 Assessment Units Proposed for Delisting

For purposes of the Integrated Report, DEQ refers to a delisting as any AU-cause combination that is removed from Category 4 or Category 5. Delistings have to be supported by a detailed rationale. The following AUs are being proposed for delisting in the next Integrated Report:

ID17040202SK022_02, Moose Creek—source to confluence with Henrys Fork

- Listed for combined biota/habitat bioassessments.
- SEI data (Appendix C) indicate no sediment impairment to this AU, and BURP data indicate the evaluated reach has covered and stable streambanks; however, this AU was likely mistakenly evaluated as a result of misapplied BURP site selection procedures. This low-gradient, soft-bottomed stream influences streambed composition and embeddedness measures. Furthermore, no riffles were found in two BURP locations, which influence macroinvertebrate communities and the likelihood that fish would be present in sufficient numbers to earn high index scores. Until an appropriate assessment

tool is created for low-gradient, soft-bottomed streams, this AU should be moved to Category 2.

ID17040203SK007_02, **Conant Creek—Idaho/Wyoming border to mouth**

- Listed for combined biota/habitat bioassessments.
- This AU was listed in Category 5 based on data collected in 1997 at two streams within the AU.
- Since 1997, streams were revisited to reassess beneficial use support but have been dry. During 1997 BURP data collection, the streams assessed were 1 meter or less in width and at a flow rate of 1 cubic foot per second or less. The flow rate of 1 cubic foot per second appears to be an estimate, as no flow equipment was noted in the data notes. Streams in this AU have been visited in 2006 and 2014; in each sampling event, the stream was dry. The accessible streams within this AU are not likely perennial streams, and this AU should be removed from future analysis. Beneficial uses within this AU are undesignated and presumed to support cold water aquatic life and secondary contact recreation. An existing use of salmonid spawning is listed, but since the BURP location associated with this assessment is located at the confluence with a perennial body of water, the fish captured were unlikely resident fish. Additionally, data show only three fish were captured during the field visit and most likely moved into the assessed stream when temporary waters were available.
- This AU should be moved to Category 3 due to an insufficient amount of recent data available. If dry conditions persist, this AU should be removed from the analysis of beneficial use support as a nonperennial water.

ID17040203SK007_03, **Conant Creek—Idaho/Wyoming border to mouth**

- Listed for combined biota/habitat bioassessments.
- This AU was listed in Category 5 based on data assessed in 2010; however, 2013 and 2014 BURP data show passing scores of measured indices. Fish were not sampled for in 2013, but in 2014 coldwater fish species and juvenile fish were captured during fish sampling. This new data indicate that the 3rd order of Conant Creek has existing uses of cold water aquatic life and salmonid spawning. Additionally, SEI data collection conducted near the 2013 and 2014 BURP locations showed no excessive streambank erosion (Appendix C). BURP data indicate the stream has covered and stable streambanks with a variety of fish habitat types not impacted by instream fines or high levels of embeddedness. The data suggest this AU is fully supporting the presumed use of cold water aquatic life.

3 Pollutant Source Inventory

Pollutants within the Upper and Lower Henrys Fork subbasins are primarily sedimentation, water temperature, and *E. coli*. Load allocations were established in the *Upper and Lower Henry's Fork Total Maximum Daily Loads: Addendum to the Upper Henry's Fork Subbasin Assessment and TMDLs* approved by EPA in 2010 (DEQ 2010a). This TMDL presents new load allocations for impairments other than those addressed in the 2010 TMDL.

3.1 Point Sources

No known unpermitted point sources exist in this area. Permitted point sources with National Pollutant Discharge Elimination System (NPDES) permits include the City of Ashton and the City of St. Anthony wastewater treatment plants and the Idaho Department of Fish and Game (IDFG) fish hatchery in Ashton, Idaho. These permitted point sources do not discharge into waters considered in this TMDL and will not receive a wasteload allocation or an adjustment to any existing wasteload allocations as part of this TMDL evaluation.

3.2 Nonpoint Sources

Land uses in the subbasins consist mainly of grazing and recreation. Nonpoint sources of pollution associated with these land uses include sediment delivery, increased temperature loading, and in some cases, elevated bacteria. This type of nonpoint source pollution can occur over a wide area of the subbasins.

A direct relationship exists between streambank erosion and loss of riparian vegetation. As stabilizing vegetation is removed, streambanks become unstable and bank erosion follows. As streambank erosion progresses, depositional features form in the channel that redirect current and further reduce bank stability. This process continues until the stream forms a new floodplain and deposition forms new streambanks that become colonized with stabilizing vegetation. This process can take many years once channel alteration begins.

3.3 Pollutant Transport

Pollutant transport refers to the pathway by which pollutants move from the pollutant source to cause a problem or water quality violation in the receiving water body. The bulk of the sediment-laden soil transport comes from streambank erosion during several weeks of high streamflow during spring runoff. Unprotected stream fords and mismanaged road maintenance can also deliver large amounts of sediment to streams.

4 Summary of Past and Present Pollution Control Efforts and Monitoring

Numerous research and restoration activities have been completed or are currently being implemented in the Henrys Fork subbasins. Some of the projects that have taken place since the 2010 5-year review (DEQ 2010b) and TMDL (DEQ 2010a) are described below.

4.1 USFS Caribou-Targhee National Forest

CTNF personnel have completed or are currently working on numerous projects and data collection efforts in the Henrys Fork subbasins. Details can be obtained from their office or website; however, some projects are highlighted in this section to illustrate the ongoing efforts to improve water quality and habitat.

Antelope Creek and Big Bend Creek Crossings (2012)—This project was a collaborative effort between Harriman State Park, the CTNF, and the Henry's Fork Foundation (HFF). The project improved two road-stream channel crossings, one on Big Bend Creek and one on Antelope Creek. The undersized culverts were replaced with bottomless box culverts. The new structures easily allow for migration passage by fish and other aquatic organisms. The stream channel through the crossing replicates the natural channel upstream and downstream of the crossing, thereby ensuring the productivity of these streams.

Bear Gulch Road Closure (Forest Road 159) (2012)—A proposal to close Bear Gulch Road 159 and create a trail was approved and completed in 2012 to protect resource values.

Big Bend Spring Livestock Exclosure (2012)—This project was a collaborative effort between CTNF and the HFF. USFS rebuilt a livestock grazing exclosure that protects the spring source of Big Bend Creek. The old fence was in disrepair and was replaced.

Duck Creek Beaver Dam Analogs (2017)—USFS and IDFG partnered to install several beaver dam analogs along Duck Creek.

Fish Creek Restoration Project—USFS restored this tributary to Henrys Fork in 2012 by placing native sedge mats within the stream to create new banks. The intention was to narrow the channel to increase flow velocities and sediment transport, which will improve trout spawning, rearing, and overwintering.

Fish Pond Spillway Stabilization (2014)—The project was a collaboration between USFS, the HFF, and Harriman State Park. The work included two components:

1. Fish Pond Dam spillway: USFS stabilized several eroding streambanks along the spillway channel of the Fish Pond Dam.
2. Fish Creek riffle hardening: The Fish Creek Stream Enhancement project was completed in 2012. One additional riffle was hardened with large alluvial gravel.

Harriman Fish Pond (2014)—This project, completed in 2014, rehabilitated the recreational Harriman Fish Pond site, improved access roads, defined parking areas, and closed approximately 250 feet of road located in a wetland area.

Horseshoe Lake, Sheep Falls, Harriman Fish Pond, and Coffee Pot (2014)—This project, completed in 2014, rehabilitated dispersed recreation sites, improved access roads, rebuilt trails, and defined parking areas at various locations on the Ashton/Island Park District.

Peterson Cabin Relocation (2016)—The USFS worked with a special use permit holder to remove a cabin and other infrastructure from national forest system lands. The cabin was relocated to private land. The project also included removing several other outbuildings, a water tank, a domestic water spring development, propane tank, and other items. The impacts were removed from an aquatic influence zone, and the area was rehabilitated. The cabin owner funded the project, but the USFS contributed oversight time.

Old Chick Road (2014)—The USFS armored and improved a ford on Old Chick Creek Road (FSR #117) to increase public safety and protect water resources. Old Chick Creek Road and snowmobile trail is a popular route for both summer and winter visitors to the forest. Streamflow at the ford has dramatically increased in the past few years because a beaver dam on Tom's

Creek has enlarged, causing water to overflow from the creek and enter another channel that crosses the road. The road approaches eroded away and contributed sediment to the stream. The USFS road crew rebuilt the ford and armored it with rock to reduce erosion.

Tygee Creek Road-Stream Crossing (2012)—Improved a road-stream crossing to allow for aquatic organism passage.

Warm River Platform (2017)—CTNF proposed to replace the existing handicap-accessible fishing platform adjacent to Warm River campground with a similar platform to improve recreation user accessibility and fishing access and to protect the riparian resources along Warm River. This project was completed in 2017.

Wood Road 16 (2012)—Improved road drainage to reduce erosion.

Ashton/Island Park Eight Allotment Range Grazing Analysis (2019)—This proposed project will analyze and disclose the effects of livestock grazing activities on the Fogg Butte, Ripley Butte, Bootjack, Grandview, Gerritt Meadows, West Lake, Antelope Park, and Fall River cattle and horse allotments.

4.2 Henry's Fork Foundation Monitoring

In 1996, the HFF began the Habitat Assessment Project, which collected information on aquatic and riparian habitat conditions, fish populations, and aquatic invertebrates on every reach of the Henrys Fork and most of its tributaries. That project required 5 years to complete and provided a set of information that could serve as a baseline to compare with future conditions.

In 2000, a set of nine indicator sites were selected for long-term monitoring. Six of these are located on the main stem of Henrys Fork from Mack's Inn to Rexburg, and one each on three tributaries: Henrys Lake Outlet, Sheridan Creek, and Fall River. These sites were monitored each year from 2001 through 2005, adding to the data collected during the 1990s.

The next round of monitoring is under way, providing a 20-year comparison with data collected during the initial habitat assessment and a 10-year comparison with conditions in 2005. The latest project is Henrys Fork water quality monitoring.

Ecological processes and physical properties of water critical to growth and survival of wild trout are being studied as part of the latest monitoring project. The placement of study sites helps identify how water quality changes along the course of the Henrys Fork as reservoirs, irrigation withdrawal and return-flow points, tributaries, and natural ecological boundaries affect physical, chemical, and biological processes. This knowledge will help river managers optimize water quantity and quality.

After a successful first year of installing and monitoring four stations along the Henrys Fork upstream of Ashton Reservoir, the HFF expanded its water quality monitoring network into the lower watershed during summer 2015. They installed automated data sondes near Ora Bridge, St. Anthony, and Salem-Parker highway, complementing those installed in 2014 at Flatrock Club, Island Park Dam, Pinehaven, and Marysville.

The HFF sondes record temperature, dissolved oxygen, depth, dissolved solids, turbidity, chlorophyll, and blue-green algae at 15-minute intervals. At each sondes site, staff regularly collect water samples, which are analyzed for nutrient and suspended sediment concentrations.

The results from field sampling will be used to develop statistical relationships between constituents that cannot be measured by the sondes and those that can so future sonde data can be used to infer information about a wide range of water quality parameters.

In 2015, the HFF focused intensive water quality sampling at Island Park Dam to identify the cause of high turbidity events observed immediately downstream of the dam during the past few summers. This study paired a water quality sonde on the west side of the river with the existing HFF sonde on the east side. In addition, water quality samples were taken at various depths in the reservoir immediately upstream of the dam in cooperation with DEQ and IDFG.

Four more sondes were installed in 2016 in Henrys Fork tributaries. The HFF is pursuing potential partnerships that would allow installing additional sondes in the Teton River watershed in future years, resulting in a network of a dozen or more stations used to monitor water quality throughout the watershed for the next 20 years or more.

The HFF and DEQ are conducting weekly depth profiling of the Henry's Lake and Island Park Reservoirs to continue the sampling that occurred in 2015 and to characterize the detailed water quality of the reservoir over time.

The HFF is also working with a graduate student from Indiana University who will be conducting his master's thesis on research related to water quality in Island Park Reservoir. The research project with Royer Laboratory and the HFF will study how climate change and reservoir age influence water quality in reservoirs and their tailwaters. He will focus on collecting and examining water quality data to see if nutrient and sediment levels in the reservoir and its tailwater have changed over time and if any connection exists to climate change or the age of Island Park Dam.

Caldera Project: Restoring Wild Trout Fisheries—The Caldera Project, named for the 28-mile section of river from Island Park Dam to Mesa Falls, includes the Ranch, Box Canyon, and many other popular stretches. Through the Caldera Project, the HFF coordinates a team of scientific experts to build on existing research in understanding the unique aquatic habitat of the Caldera.

The Caldera Project also identifies restoration projects to improve the legendary Caldera fisheries:

> **Habitat-Use Study: What Fish Want**—In spring 2013, the HFF and partnering agencies embarked on a 3-year study to find the ultimate link between the trout population and fishing experience in the famed Harriman State Park section of the Henrys Fork. The study has assessed the habitat preferred by adult Rainbow Trout in the Harriman State Park reach throughout the fishing season, with a long-term goal of improving adult trout habitat in the Harriman reach.

> **Thurmon Creek Study: The Value of Small Tributaries**—The 9-mile Ranch section of the Henrys Fork through Harriman State Park is legendary for fly-fishing. The

reputation and popularity of the Ranch have made it the focus of research for over 30 years. Dozens of studies have created a wealth of knowledge about the fishery and significant efforts to improve it. The Ranch is the product of a complex set of natural and human-made influences, and the quality of angling has varied over the years.

Since 2008, the HFF has examined how small tributaries like Thurmon Creek in Harriman State Park contribute to the survival of trout in their first winter of life. Through the use of passive integrated transponder (PIT) tags, the HFF marks each trout migrating into Thurmon Creek with a unique code that provides insight on survival, winter growth rates, and most importantly, when the trout use habitat in the creek.

An automated PIT-tag detection system was operated over winter 2012–2013 to record the fish migration out of Thurmon Creek and back into the Henrys Fork. These migration data will be used to quantify the number of young fish that successfully winter in Thurmon Creek and determine future habitat and fish passage improvements that will enhance the contribution of Thurmon Creek to the Henrys Fork population.

Project partners and contributors include Harriman State Park, Cross Charitable Foundation, Fall River Electric Co-op, IDFG, Parts Service, Kast Gear, Snake River Prototype, and individual donors.

Buffalo Fish Ladder: Monitoring the Contribution to Fisheries—As of summer 2013, over 30,000 Rainbow Trout have migrated upstream through a fish ladder at the Buffalo River Hydroelectric Project. A large number of Brook Trout, whitefish, and nongame fish species have also used the ladder. Use of the fish ladder has generally increased since it was installed, as well as the wild trout population in the Henrys Fork.

The hydroelectric project was relicensed in 2004, and several fish passage improvements were made at the facility in 2005 to allow juvenile Rainbow Trout from the Henrys Fork to access crucial winter habitat. Offspring from spawning Rainbow Trout in the Buffalo River and juvenile trout migrating from the Henrys Fork are able to spend their first winter in the Buffalo River watershed upstream of the dam. After their first winter, these juvenile trout move to the Henrys Fork where they can grow and contribute to the fishery from Box Canyon through Harriman State Park.

Project partners and contributors include CTNF, IDFG, and Fall River Rural Electric Cooperative (hydroelectric project owner).

Survival and Movement of Adult Rainbow Trout During Winter and Spring in the Henrys Fork of the Snake River—Radio telemetry was used to evaluate the survival and winter movement of adult Rainbow Trout in the Caldera section of the Henrys Fork of the Snake River under low and extremely low early winter flow conditions. Spring movement was also evaluated to assess whether the population estimates conducted in Box Canyon each spring represent fish from adjacent river reaches, and how emigration between mark and recapture periods may affect the population estimate.

Survival of radio-tagged trout was nearly 100% during early winter under both low and extremely low flow conditions, and winter movement did not differ between the two years. Few radio-tagged Rainbow Trout from downriver were present in the monitoring reach when the population estimate is normally conducted, indicating that large fluctuations in fish numbers in downstream reaches would likely be undetected based on population estimates conducted in the monitoring area. Establishing a regular population monitoring area in downstream reaches was recommended. Emigrations from the monitoring reach between the mark and recapture period were determined to have a minimal effect on the population estimate. However, all the radio-tagged trout that moved out of the monitoring reach during May moved into a short section of river between the monitoring reach and Island Park Dam. Therefore, emigration could largely be accounted for by extending the monitoring reach upstream to Island Park Dam.

This project was conducted with the assistance of Gregory Aquatics with funding from the HFF and Marine Ventures Foundation.

Hydrological and Ecological Assessment of the Henry's Fork River and Island Park Reservoir to Support Multi-Stakeholder Management - This is a four-year project being conducted by two Ph.D. students from Utah State University, with funding and logistical support from the HFF. The long-term goal of the project is to create a watershed-wide model to inform management of the Henrys Fork system to meet objectives of multiple stakeholders. Project timeline is 2018–2022. There are two components to this project.

- **Upper Henry's Fork**: Headwaters to Island Park Reservoir, including Henry's Lake Outlet and the reservoir itself.
  - Understand how nutrients influence fishery quality and ecosystem production in the Henry's Fork River and its tributaries upstream of Island Park Reservoir as well as Island Park Reservoir itself.
  - Quantify the underlying mechanisms of nutrient movement, including but not limited to how nutrient concentrations in the Mack's Inn reach relate to river hydrology, Island Park Reservoir limnology, and nutrient type, source, and timing.
  - Understand how human activity, including the new WWTP, recreational use, and climate change, may influence nutrient flux and/or production in the Mack's Inn reach and Island Park Reservoir system.
  - Understand the extent and nature of the interaction between rivers and reservoirs, including the magnitude and direction of nutrient fluxes. Use the results to develop a watershed-scale nutrient budget and model.
  - Disseminate information and products resulting from this project to local, regional, and national audiences of stakeholders, scientists, and managers.
- **Lower Henry's Fork**: downstream of Ashton Reservoir
  - Determine factors limiting trout recruitment in the lower Henry's Fork.
  - Quantify relationships between streamflow and habitat in the study area, focusing on trout habitat but also including floodplain and riparian habitats where appropriate.
  - Measure and model irrigation return flows to river reaches in the study area at fine spatial and temporal resolution, with emphasis on groundwater returns.
  - Use the results of the components above to develop watershed-scale models and strategies for water use and water management that will enhance fish and wildlife habitat in the lower watershed while minimizing delivery of storage water from

Island Park Reservoir and meeting current and future demand for irrigation and managed recharge.
- Identify existing wetlands in the project area and potential wetland improvement/mitigation projects.
- Disseminate information and products resulting from this project to local, regional, and national audiences of stakeholders, scientists, and managers.

Fisheries Biology and Habitat Management - The HFF is participating in several fisheries-related activities in the Henry's Fork, including:

- Assisting IDFG with annual fish population monitoring
- Maintaining a database of angler-reported occurrence of gill lice
- Maintaining and monitoring fish passage facilities at Buffalo River Dam and Chester Dam (in cooperation with Fall River Rural Electric Cooperative)
- Maintaining and monitoring three miles of riparian fence along Henry's Fork at Last Chance and Wood Road 16.
- Participation in Henry's Fork Drought Management Planning Committee to optimize water management under legal and administrative constraints of water law and delivery of water rights.

Macroinvertebrate Sampling — The HFF has conducted annual monitoring of aquatic macroinvertebrates within the Henry's Fork since 2015. The sampling consists of collecting quantitative Hess samples at five locations along the river to characterize the macroinvertebrate population by identifying up to 200 individuals per sample to species and calculating appropriate metrics of population dynamics in order to analyze community metrics across locations and years. Locations sampled include Flat Rock, Last Chance, Osborne Bridge, Marysville (upstream of Ashton Reservoir), and St. Anthony.

4.3 Egin Aquifer Recharge Project

The Egin Lakes area is a potential ground water recharge site. However, previous investigations, including a pilot recharge project, concluded that more detailed investigations were needed to determine recharge feasibility and benefit to the Eastern Snake River Plain aquifer. Further studies completed by the Idaho Water Resources Research Institute and Idaho Department of Water Resources proved the area was a viable site for aquifer recharge. A recently-completed canal in the Egin Bench area will funnel water from Henrys Fork to a porous basin during high water years, which will help refill the depleted Eastern Snake River Plain aquifer over the coming decades.

5 Total Maximum Daily Loads

A TMDL prescribes an upper limit (i.e., load capacity) on discharge of a pollutant from all sources to ensure water quality standards are met. It further allocates this load capacity among the various sources of the pollutant. Pollutant sources fall into two broad classes: point sources, each of which receives a wasteload allocation, and nonpoint sources, each of which receives a load allocation. Natural background contributions, when present, are considered part of the load allocation but are often treated separately because they represent a part of the load not subject to control. Because of uncertainties about quantifying loads and the relation of specific loads to attaining water quality standards, the rules regarding TMDLs (40 CFR Part 130) require a margin of safety be included in the TMDL. Practically, the margin of safety and natural background are both reductions in the load capacity available for allocation to pollutant sources.

Load capacity can be summarized by the following equation:

$$LC = MOS + NB + LA + WLA = TMDL$$

Where:

LC = load capacity
MOS = margin of safety
NB = natural background
LA = load allocation
WLA = wasteload allocation

The equation is written in this order because it represents the logical order in which a load analysis is conducted. First, the load capacity is determined. Then the load capacity is broken down into its components. After the necessary margin of safety (MOS) and natural background, if relevant, are quantified, the remainder is allocated among pollutant sources (i.e., the load allocation and wasteload allocation). When the breakdown and allocation are complete, the result is a TMDL, which must equal the load capacity.

The load capacity must be based on critical conditions—the conditions when water quality standards are most likely to be violated. If protective under critical conditions, a TMDL will be more than protective under other conditions. Because both load capacity and pollutant source loads vary, and not necessarily in concert, determining critical conditions can be more complicated than it may initially appear.

Another step in a load analysis is quantifying current pollutant loads by source. This step allows for the specification of load reductions as percentages from current conditions, considers equities in load reduction responsibility, and is necessary for pollutant trading to occur. A load is fundamentally a quantity of pollutant discharged over some period of time and is the product of concentration and flow. Due to the diverse nature of various pollutants, and the difficulty of strictly dealing with loads, the federal rules allow for "other appropriate measures" to be used when necessary (40 CFR 130.2). These other measures must still be quantifiable and relate to water quality standards, but they allow flexibility to deal with pollutant loading in more practical and tangible ways. The rules also recognize the particular difficulty of quantifying nonpoint loads and allow "gross allotment" as a load allocation where available data or appropriate predictive techniques limit more accurate estimates. For certain pollutants whose effects are long term, such as sediment and nutrients, EPA allows for seasonal or annual loads.

5.1 Sediment TMDLs

Follow-up investigations determined that excess sedimentation is contributing to the biological impairment of the Twin Creek and Sand Creek AUs. Since sediment is a pollutant regulated by a narrative surface water quality criterion, numeric targets must be determined for the AU. In this region of Idaho, 80% bank stability is used as a surrogate target for supporting beneficial uses to be protective of stream habitat (1995). At this percentage of bank stability, a stream is more likely to meet an inchannel substrate target of less than 28% fine sediment (<6.3 millimeters), which is approximately the median range to support salmonid egg and fry survival in redds throughout Idaho (DEQ 2014; DEQ 2003; McNeil and Ahnell 1964).

This sediment analysis characterizes sediment loads that developed over time using cumulative annual rates determined from characteristics observed during field investigations. SEIs were developed to sample approximately 10% of a representative stream reach that generate sediment loads that are used to describe the entire AU. The methods used to estimate annual sediment loads are described in detail in DEQ’s standard operating procedure manual for SEIs (DEQ, 2014). Observed sediment loads have been influenced by peak and base flow conditions. The annual sediment load is not usually equally distributed throughout the year, but rather concentrated to a few months when peak flows occur.

SEIs were used to calculate the annual load and the desired future sediment load to restore full support of beneficial uses related to cold water aquatic life. The erosion inventory was developed to identify sediment loads at existing erosion rates and to identify future sediment loads that can be expected based on predicted erosion rates after implementing best management practices (BMPs).

The sediment TMDL calculated in this document was achieved by determining the sediment load capacity of an AU through subsampling a representative reach of stream and extrapolating the resulting load capacity calculations to the remainder of the AU. A proportion was reserved for a margin of safety and natural background from the sediment load capacity. Since there are no point sources of sediment in the subbasin, a wasteload allocation is not necessary. The calculations for the sediment TMDLs in this document were made using the following formula:

$$\text{TMDL} = \text{LA} = \text{LC} - \text{MOS} - \text{NB}$$

Where:

LA = load allocation
LC = load capacity
MOS = margin of safety
NB = natural background

5.1.1 Instream Water Quality Targets

To restore full support of beneficial uses in the Twin Creek and Sand Creek AUs listed for combined biota/habitat bioassessments, the underlying cause required further investigation. Results indicate the most likely cause of impairment is sedimentation. TMDL load allocations were determined using the best available data and field verification. DEQ collected streambank stability data and measurements in 2015. Calculations, maps, photographs, and field notes documenting this work are provided in Appendix C.

5.1.2 Target Selection

Sediment target selection depends on existing narrative criteria. Sediment targets selected for this TMDL are based on streambank stability equated to quantitative allocations of streambank erosion expressed in tons of sediment per year. The reduction in streambank erosion detailed in this TMDL is related to expected increases in riparian vegetation density from applying selected BMPs. Increased riparian vegetation will armor streambanks and reduce lateral recession rates, in turn decreasing sediment load and stream energy.

Under natural background conditions, sediment loading rates from bank erosion equate to 80% bank stability for streams with similar size, shape, and underlying geology. As such, the 80% bank stability target based on SEIs will be the target for sediment in this TMDL. The 80% target has been used in other TMDLs throughout the state and is protective while still allowing for sediment fluctuation present in natural systems.

5.1.3 Water Quality Monitoring Points

DEQ monitors streambank stability by conducting SEIs. When bioassessments indicate impairment and sediment is suspected as a pollutant, DEQ examines existing data and aerial photos to identify homogenous reaches of AUs to monitor for streambank stability. In the field, DEQ estimates the length of the completely stable streambanks and then measures the length, bank height, and condition of streambanks that are eroding. Recession rates (feet per year) of the eroding streambanks are determined in the field according to their condition rating. The percentage of stable and eroding streambanks are extrapolated to similar stream types in the AU. Extrapolating erosion and erosion rates to similar stream segments within the AU helps identify locations where remediation and restoration activities may be most productive in reducing sediment loads.

DEQ conducted SEIs representing four AUs at the nine locations indicated in Table 3. Two AUs, Twin Creek AU in the Upper Henrys Fork subbasin and the Sand Creek AU in the Lower Henrys Fork subbasin, each exhibited sediment impairment at one sampling location and received TMDLs. Three SEIs were completed in the Twin Creek AU. Two were completed in forested sections and did not show signs of excessive streambank erosion. The third was done in a valley bottom meadow with differing land use practices and exhibited sediment impairment characteristics. The 3rd order Conant Creek AU was examined to determine if sediment could be limiting beneficial uses, but did not have any indications of current sediment impairment or evidence of significant sources of sediment or hillslope erosion that would lead to impairments. The Moose Creek AU was improperly assessed and should be removed from Category 5 as DEQ does not currently have a proper assessment methodology for slow-moving, soft-bottomed streams.

Table 3. 2015 SEI monitoring locations.

Stream	Assessment Unit Number	Downstream Latitude	Downstream Longitude	Upstream Latitude	Upstream Longitude
Moose Creek 1	ID17040202SK022_02	44.4856	-111.2876	44.4852	-111.2860
Moose Creek 2	ID17040202SK022_02	44.4597	-111.2309	44.4582	-111.2313
Twin Creek 1	ID17040202SK030_02	44.5885	-111.3159	44.5900	-111.3141
Twin Creek 2	ID17040202SK030_02	44.5903	-111.3160	44.5909	-111.3150
Twin Creek 3	ID17040202SK030_02	44.5894	-111.3176	44.5903	-111.3160
Conant Creek 1	ID17040203SK007_03	44.0044	-111.1538	44.0052	-111.1491
Conant Creek 2	ID17040203SK007_03	44.0075	-111.1438	44.0063	-111.1422
Sand Creek 1	ID17040203SK013_04	44.1044	-111.5817	44.1065	-111.5844
Sand Creek 2	ID17040203SK013_04	44.1260	-111.5973	44.1288	-111.5967

The AUs exhibiting sediment impairment should be monitored as watershed improvement projects confirm that streambanks are becoming more stable. The SEI data are located in Appendix C.

5.1.4 Load Capacity

The sediment load capacity is the sediment loading rate at which beneficial uses are supported, and reductions will be determined to meet those loads. The assumption is this rate will be achieved at 80% streambank stability, possibly in combination with decreasing the streambank lateral recession rate. Progress toward the load capacity will be made through near-stream trail and road maintenance, land management, riparian vegetative cover, and stream channel condition improvements.

The calculation for both the eroding and stable streambanks determines the relationship between load capacity at 80% streambank stability and the current load of the eroding areas. The load capacity is the natural, minimally-eroded state (20%) one would expect of a primarily-covered, stable streambank. The current load represents the tons of sediment per year calculated for the eroding streambanks at their current condition representative of the cumulative total of all SEIs completed within an AU. The difference between the current load and the load capacity is the necessary load reduction for the entire AU.

5.1.5 Estimates of Existing Pollutant Loads

To the extent possible, background loads should be distinguished from human-caused increases in nonpoint loads. Federal regulations allow that loadings "...may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading" (40 CFR 130.2(g)). The volume of eroding streambank at bankfull condition was calculated by measuring eroding bank height and length and evaluating the bank condition to estimate lateral recession rate during periods of high discharge, including erodibility of the soil type. Detailed results are in Appendix C. As a result of these survey results and calculations, the current loads estimated for the Upper and Lower Henrys Fork subbasins are presented in Table 4 from AUs where data could be collected based on access or site conditions.

The current sediment load is calculated for Twin Creek USFS Boundary to Mouth – ID17040202SK030_02, which corresponds to portions of Twin Creek outside of the national forest boundary. The current sediment load is calculated from a surveyed reach that is representative of the stream in that AU. If a current load does not exceed the load capacity for an AU, a TMDL was not created.

Table 4. Current sediment loads from nonpoint sources in the Upper and Lower Henrys Fork subbasins.

Load Type	Assessment Unit	Land Use	Current Load (tons/year)	Estimation Method	TMDL Required
		Upper Henrys Fork			
Annual sediment loading rate	ID17040202SK030_02 Twin Creek - USFS boundary to mouth	State and Private	8.44	Observed erosion rate volume extrapolated to length of similar stream	Yes
		Lower Henrys Fork			
Annual sediment loading rate	ID17040203SK007_03 Conant Creek—Idaho/Wyoming border to mouth	USFS	11.79	Observed erosion rate volume extrapolated to length of similar stream	No
	ID17040203SK013_04 Sand Creek—Pine Creek to mouth	BLM	70.28	Observed erosion rate volume extrapolated to length of similar stream	Yes

Note: Not applicable (NA), United States Forest Service (USFS), United States Bureau of Land Management (BLM). Reference Figure 3 for geographic extent of TMDL with current AU structure and previous AU structure.

5.1.6 Load Allocation

Sediment load allocations are estimated targets to improve water quality so the beneficial use of cold water aquatic life is fully supported. Table 5 details the annual and daily allocations for AUs with TMDLs in the Upper and Lower Henrys Fork subbasins. The annual load allocation is expresses as the load capacity minus the margin of safety and natural background allocations.

Greater sediment loads can be expected at higher flows, with significantly less erosion during low flow periods. The entire load is allocated to nonpoint sources and includes natural background. The sediment-impaired streams in the Upper and Lower Henrys Fork subbasins are impaired from nonpoint sources (i.e., streambank erosion). Since no point sources discharge to the water bodies in this TMDL, wasteload allocations are not necessary.

Table 5. Nonpoint source sediment load allocations for Upper and Lower Henrys Fork subbasins.

Assessment Unit	Load Capacity (tons/year) **(lbs/day)**	Margin of Safety (tons/year) **(lbs/day)**	Natural Background (tons/year) **(lbs/day)**	Load Allocation (tons/year) **(lbs/day)**	Existing Load (tons/year) **(lbs/day)**	Load Reduction (tons/year) **(lbs/day)**	Percent Reduction (%)
ID17040202SK030_02 Twin Creek - USFS boundary to mouth	2.1 **11.51**	0.21 **1.15**	0.42 **2.30**	1.47 **8.05**	8.44 **46.25**	6.34 **34.74**	75%
ID17040203SK013_04 Sand Creek - Pine Creek to mouth	62.39 **341.86**	6.24 **34.19**	12.48 **68.38**	43.67 **239.29**	70.28 **385.10**	7.89 **43.23**	11%

Note: Bold text represents allocations or loads in pounds per day

5.1.6.1 Margin of Safety

A 10% MOS is applied to ensure that beneficial uses will be restored. This MOS is applied by determining 10% of the load capacity. The load reduction is determined by subtracting the load capacity from the current load inclusive of the 10% MOS. A MOS of 10% has commonly been used by DEQ in other TMDLs for not only sediment, but also other impairments. EPA guidance (EPA, 1999) suggests that a MOS must be included to address uncertainty in the analysis, and can be explicitly stated by setting aside a portion of the allowable load. No directive has been provided on what specific proportion of the allowable load should be reserved as a MOS, but guidance received through the approval of other TMDLs using a 10% MOS indicates that value as sufficient to account for any uncertainty about the relationship between the sediment load and the quality of the receiving waterbody.

5.1.6.2 Seasonal Variation

Most of the total annual sediment load erodes from the streambanks during the spring high flow caused by snowmelt or rain-on-snow events when the streams are at or near bankfull levels. Throughout most of the year during base flow conditions, stream discharge is usually too low to create large amounts of scour or to transport high volumes of sediment. High flows create the greatest scour and have the greatest capability of carrying high bed and suspended loads (Allan 1995). SEI measures eroded streambanks at their bankfull level to account for this sediment load. Monitoring streambank erosion is done during base flow conditions to more accurately measure erodible banks.

5.2 E. coli Bacteria TMDL

One AU in the Upper Henrys Fork subbasin was listed as impaired by *E. coli* bacteria in Category 5 of Idaho’s 2010 Integrated Report (§303(d) list). This AU represents the 3rd order segment of Timber Creek before emptying to the northern portion of Henrys Lake. *E. coli* sampling was conducted where the stream was accessible on public lands at or near a historic beneficial use reconnaissance program sampling location.

Idaho water quality standards state *E. coli* bacteria are not to exceed 126 cfu/100 mL as a 30-day geometric mean (Appendix B). Single sample triggers for additional monitoring are

406 cfu/100 mL for primary contact recreation uses and 576 cfu/100 mL for secondary contact recreation uses. Depending on the use, if either single sample maximum is exceeded, four additional samples must be taken every 3 to 7 days within a month's time to determine the geometric mean concentration and compare it to the standard (IDAPA 58.01.02.251.01 and 02). Based on the size and location of the stream, and an average annual flow of 12.5 cubic feet per second (cfs) (Hortness, 2006), it is possible that primary contact recreation where the ingestion of small quantities of water is likely to occur is an existing use.

Sufficient *E. coli* bacteria samples to calculate a geometric mean were collected in 2003, and instantaneous *E. coli* bacteria samples were collected in 2015. These samples show similar concentrations of *E. coli* in the late fall when compared to data collected in 2003. A geomean calculated for three of the four 2015 samples resulted in a bacteria concentration of 176.3 cfu/100mL. A fourth sample was not included in the calculation of the geomean because bacteria were not detected from the sample. The number of samples collected in 2015 is inadequate to determine a violation of the geomean-based state criterion, but can provide insight as to the general concentrations of bacteria within the stream.

The existing load used in the TMDL calculation was based on a geomean of the three samples that showed a measureable concentration of bacteria. The geomean of multiple samples provides an existing load calculation that minimizes the variability in data associated with surface waters. The data is not being used to provide a listing or delisting justification where strict application of the standard is necessary as the AU is already listed.

The geometric mean showed that *E. coli* concentration reductions are necessary for Timber Creek (AU ID17040202SK035_03) to support primary and secondary contact recreation uses. Timber Creek's geometric mean concentration was 176.3 cfu/100 mL, which will require a 43% reduction to meet water quality standards (Section 5.2.4).

The *E. coli* target should be met at all times. To protect beneficial uses, load allocations are calculated for critical low flow conditions. Streamflow data was not collected at the time of bacteria sampling. There are no USGS gaging stations on any of the streams where the TMDL was developed. For Timber Creek, upstream water use and diversions may cause a situation where measured flows would be lower than the watershed potential and decrease the accuracy of the calculated daily loads. In order to address these issues, estimates of the seven-day average low flow expected to recur every ten years (7Q10 flow) were used to calculate the TMDL. Estimates of flow were made using a web based application called StreamStats that includes parameters of drainage area and average precipitation to estimate low flow statistics in unregulated streams in Idaho (Hortness, 2006). StreamStats estimates of the 7Q10 flow were calculated at the location of bacteria sampling conducted in 2015. The critical low flow values for calculating the *E. coli* load capacities are provided in Table 6.

Table 6. Critical low flow for calculating *E. coli* bacteria load capacities based on StreamStats estimates.

Water Body	Assessment Unit Number	Critical Low Flow (cubic feet per second)	Longitude	Latitude
Timber Creek - source to mouth	ID17040202SK035_03	2.53	44.6694	-111.4274

Monthly sampling shows that the summer months during low flow periods will require concentrated efforts to reduce direct access to these streams by livestock if owners, operators, and land managers intend to meet these load reductions. TMDL load reductions for *E. coli* will apply to the entire AU throughout the year. Unknown bacteria concentrations from upstream AUs have the potential to contribute to the *E. coli* bacteria load observed in the 3rd order segment of Timber Creek.

5.2.1 Instream Water Quality Targets

The Idaho water quality standard for *E. coli* bacteria is a geometric mean of 126 cfu/100 mL (IDAPA 58.01.02.251.01) (Appendix B).

5.2.2 Load Capacity

In bacteria TMDLs, the water quality standard is the load capacity of a system. The load capacity is based on critical low flows. The load capacity is calculated as a function of 126 cfu/100mL as the target and the low flow of the monitored AU according to the following example calculation:

$$E.coli\ load\ capacity\ = \frac{126\ cfu\ \times \mathrm{x}\ cf\ \times 86400\ seconds\ \times 1\ mL}{100\ mL\ \times 1\ second\ \times 1\ day\ \times 0.0000353\ cf} = \mathrm{x}\ cfu/day$$

where:

126 colony forming units (cfu) / 100 milliliters (mL) is the *E. coli* target
x cubic feet per second (cfs) is the critical low flow
86,400 seconds per day is the time conversion
1 mL per 0.0000353 cubic feet (cf) is the volume conversion

Table 7 provides the load capacities for the Timber Creek AU listed for *E. coli* impairment.

Table 7. *E. coli* bacteria load capacity calculated on critical low flow.

Water Body	Assessment Unit	Critical Low Flow (cfs)	Target Concentration (cfu/100 mL)	Load Capacity	
				cfu/day	bcfu/day
Timber Creek - source to mouth	ID17040202SK035_03	2.53	126	7,802,433,994	7.80

Notes: cubic feet per second (cfs); colony forming units per 100 milliliters (cfu/100 mL); colony forming units per day (cfu/day); billion colony forming units per day (bcfu/day)

5.2.3 Estimates of Existing Pollutant Loads

Livestock and wildlife are the most likely sources of *E. coli* bacteria found in the listed water bodies. No confined animal feeding operations or failing human septic systems are known in the affected watersheds. The percentage of the load contribution coming from each nonpoint source cannot be determined from the available data. Existing loads are based on the geometric mean of the most recent and applicable data available. Table 8 provides the existing pollutant loads for the Timber Creek AU calculated on the critical low flow. Figure 6 details the bacteria sampling location used in support of this TMDL.

Table 8. *E. coli* bacteria existing pollutant loads calculated on critical low flow.

Water Body	Assessment Unit	Critical Low Flow (cfs)	Measured Concentration (cfu/100 mL)	Existing Pollutant Load	
				cfu/day	bcfu/day
Timber Creek - source to mouth	ID17040202SK035_03	2.53	176.3	10,917,215,184	10.92

Notes: cubic feet per second (cfs); colony forming units per 100 milliliters (cfu/100 mL); colony forming units per day (cfu/day); billion colony forming units per day (bcfu/day)

5.2.4 Load Allocations

Bacteria are living organisms that have an associated die-off rate. The die-off rate fluctuates with water quality and environmental conditions. Flow and temperature dictate the actual mass of bacteria in the water and complicate the load allocation process because of the continuous fluctuation of flow and temperature that occurs during any given time period. To simplify this process, the allocation is expressed in terms of 126 cfu/100 mL, the target geometric mean concentration currently required by Idaho water quality standards.

Table 9 lists the E. coli load allocations and necessary load reductions for the Timber Creek AU with measured concentrations exceeding the standard. The load allocation includes a 10% margin of safety and an additional 10% allocation to natural background sources in the subbasin.

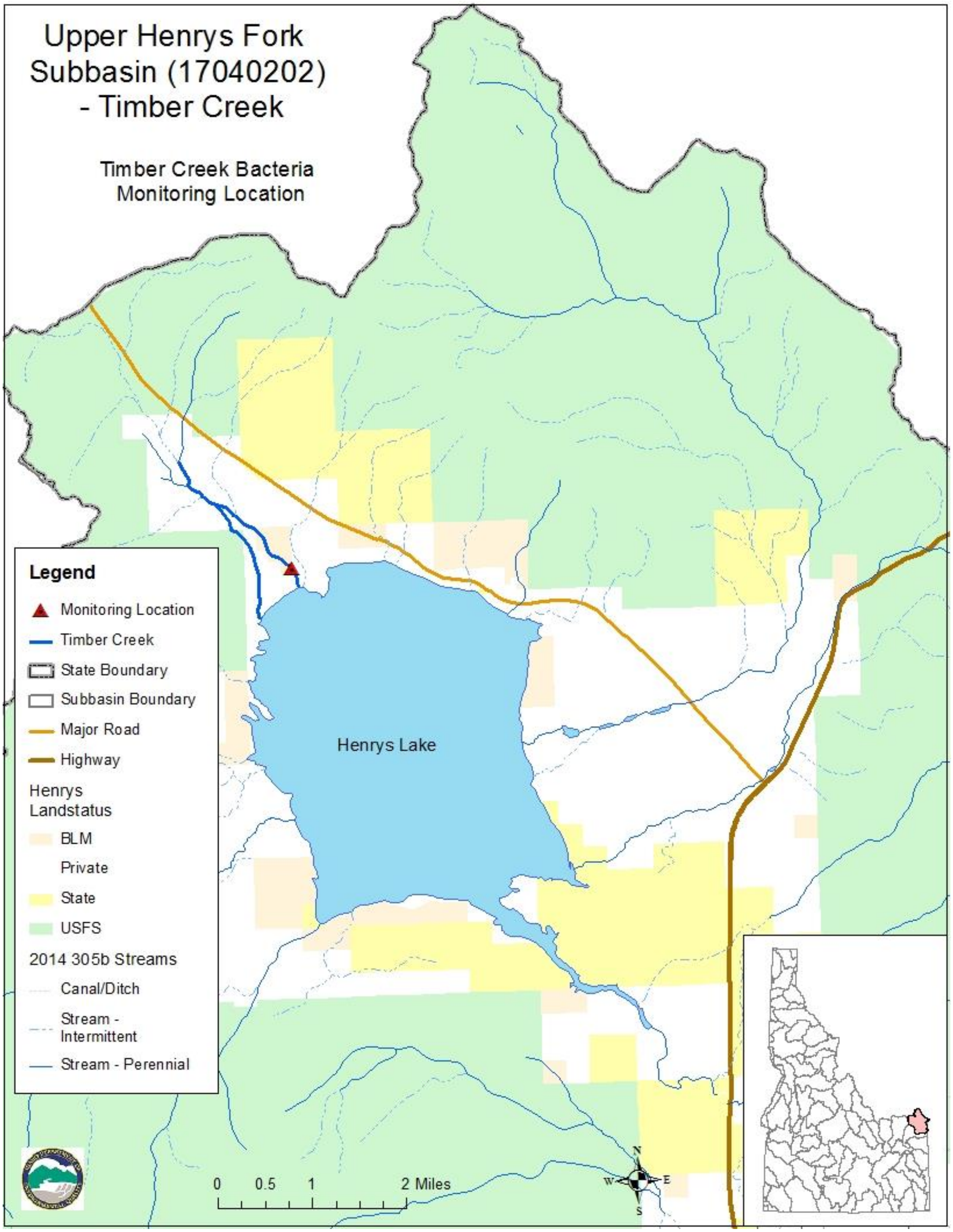

Figure 6. Timber Creek *E. coli* sampling location.

To illustrate how bacteria load needs to be controlled on a daily basis, Table 9 presents a flow-based, load analysis for the Timber Creek AU receiving a TMDL. Because flow measurements were not taken at the time of sampling, modeled critical low flows were used for load calculations.

Table 9. Nonpoint source *E. coli* bacteria load allocation for the Timber Creek AU (ID17040202SK035_03).

Water Body and Assessment Unit	Load Capacity	Natural Background	Margin of Safety	Load Allocation	Total Existing Load	Load Reduction	Percent Reduction
Timber Creek - source to mouth -concentration (cfu/mL)	126.0	12.6	12.6	100.8	176.3	50.35	29%
-load (bcfu/day)	7.80	0.780	0.780	6.24	10.92	3.11	

Notes: colony forming units per 100 milliliters (cfu/100 mL); billion colony forming units per day (bcfu/day)

5.2.4.1 Margin of Safety

Establishing a TMDL requires that a margin of safety be identified to account for uncertainty as required by federal regulations (40 CFR Part 130). The margin of safety is not allocated to any sources of a pollutant. A margin of safety is expressed as either an implicit or explicit portion of a water body's load capacity that is reserved to allow for uncertainty about the relationship between the pollutant loads and the quality of the receiving water body.

DEQ selected a 10% explicit margin of safety based on uncertainty associated with *E. coli* field duplicate measurements. Field duplicates are two samples collected at the same site and time following the same sampling and analytical procedures. One sample is termed the original sample and the other sample is termed the duplicate sample. The relative difference between the original sample and duplicate sample was calculated from data available in DEQ's water quality database from 2016 – 2019 (39 duplicate pairs) where the original sample result was less than the *E. coli* criterion (126 cfu/100 mL). The average relative difference in concentration between the original samples and duplicate samples was 10.7 cfu/100mL. This value represents the average uncertainty for individual sample results below the *E. coli* criterion, and corresponds to 8.5% of 126 cfu/100mL. A 10% margin of safety was selected to be conservative (protective) considering the data available for this analysis.

5.2.4.2 Seasonal Variation

This TMDL is based on summer *E. coli* loads. In the affected watersheds, concentrations of bacteria are likely to be the highest during the summer growing season. Grazing activity increases the bacterial load, warm temperatures encourage bacterial growth or slow their die-off, and diminished stream flows reduce the dilution capacity of streams. This season is also the time period when secondary contact recreation is most likely to occur. While recreational water contact is less likely outside of the summer season, it may occur at any time during the year.

Likewise, it is less likely that grazing will occur on these streams beyond late October. However, because both contact recreation and livestock access to the streams could occur at any time, water quality standards for *E. coli* remain in effect throughout the year.

5.2.4.3 Wasteload Allocation

No known NPDES-permitted point sources exist in the affected watersheds, so there are no wasteload allocations. If a point source is proposed that would have consequence on these waters, then background provisions addressing such discharges should involve the Idaho water quality standards.

5.3 Reasonable Assurance

Clean Water Act §319 requires each state to develop and submit a nonpoint source management plan. The *Idaho Nonpoint Source Management Plan* was approved by EPA in March 2015 (DEQ 2015). The plan identifies programs to achieve implementation of nonpoint source BMPs, includes a schedule for program milestones, outlines key agencies and agency roles, is certified by the state attorney general to ensure that adequate authorities exist to implement the plan, and identifies available funding sources.

Idaho’s nonpoint source management program describes many of the voluntary and regulatory approaches the state will take to abate nonpoint pollution sources. One of the prominent programs described in the plan is the provision for public involvement, including basin advisory groups (BAGs) and watershed advisory groups (WAGs). The Upper Snake BAG is the designated WAG for the Upper and Lower Henrys Fork subbasins.

The Idaho water quality standards refer to existing authorities to control nonpoint pollution sources in Idaho. Some of these authorities and responsible agencies are listed in Table 10.

Table 10. State of Idaho's regulatory authority for nonpoint pollution sources.

Authority	Water Quality Standard	Responsible Agency
Rules Pertaining to the Idaho Forest Practices Act (IDAPA 20.02.01)	58.01.02.350.03(a)	Idaho Department of Lands
Solid Waste Management Rules and Standards (IDAPA 58.01.06)	58.01.02.350.03(b)	Idaho Department of Environmental Quality
Individual/Subsurface Sewage Disposal Rules (IDAPA 58.01.03)	58.01.02.350.03(c)	Idaho Department of Environmental Quality
Stream channel Alteration Rules (IDAPA 37.03.07)	58.01.02.350.03(d)	Idaho Department of Water Resources
Rathdrum Prairie Sewage Disposal Regulations (Panhandle District Health Department)	58.01.02.350.03(e)	Idaho Department of Environmental Quality/Panhandle District Health Department
Rules Governing Exploration, Surface Mining and Closure of Cyanidation Facilities (IDAPA 20.03.02)	58.01.02.350.03(f)	Idaho Department of Lands
Dredge and Placer Mining Operations in Idaho (IDAPA 20.03.01)	58.01.02.350.03(g)	Idaho Department of Lands
Rules Governing Dairy Waste (IDAPA 02.04.14)	58.01.02.350.03(h)	Idaho State Department of Agriculture

Idaho uses a voluntary approach to address agricultural nonpoint sources; however, regulatory authority is found in the water quality standards (IDAPA 58.01.02.350.01–03). IDAPA 58.01.02.055.07 refers to the Idaho Agricultural Pollution Abatement Plan (Ag Plan) (ISWCC 2015), which provides direction to the agricultural community regarding approved BMPs. A portion of the Ag Plan outlines responsible agencies or elected groups (soil conservation districts) that will take the lead if nonpoint source pollution problems need to be addressed. For agricultural activity, the Ag Plan assigns the local soil conservation districts to assist the landowner/operator with developing and implementing BMPs to abate nonpoint source pollution associated with the land use. If a voluntary approach does not succeed in abating the pollutant problem, the state may seek injunctive relief for those situations determined to be an imminent and substantial danger to public health or the environment (IDAPA 58.01.02.350.02(a)).

The Idaho water quality standards and wastewater treatment requirements specify that if water quality monitoring indicates that water quality standards are not being met, even with the use of BMPs or knowledgeable and reasonable practices, the state may request that the designated agency evaluate and/or modify the BMPs to protect beneficial uses. If necessary, the state may seek injunctive or other judicial relief against the operator of a nonpoint source activity in accordance with the DEQ director's authority provided in Idaho Code §39-108 (IDAPA 58.01.02.350). The water quality standards list designated agencies responsible for reviewing and revising nonpoint source BMPs: the Idaho Department of Lands for timber harvest activities, oil and gas exploration and development, and mining activities; Idaho Soil and Water Conservation Commission for grazing and agricultural activities; Idaho Transportation Department for public road construction; Idaho State Department of Agriculture for aquaculture; and DEQ for all other activities (IDAPA 58.01.02.010.24).

5.4 Natural Background

Sediment load allocations are estimated targets to improve water quality to support the beneficial use of cold water aquatic life. The load capacity is the natural, minimally-eroded state in a vegetated and stable streambank. The load capacity is the natural background condition, currently targeted to be 80% stable streambanks. Sediment may be the causal factor for impairment; however, until the stream meets the designated beneficial uses, typically determined by passing BURP scores, any implementation and load reduction cannot be deemed successful.

The water quality standards do not make a distinction between anthropogenic and background sources of *E. coli*. Natural *E. coli* (from sources such as birds and deer) is more likely to enter the streams because of irrigation and storm conveyances. For this reason, background levels of *E. coli* will be considered in the load allocation. An additional 10% of the bacterial load has been allocated to natural background sources as an initial estimate that may be refined as more information becomes available in the future.

5.5 Construction Stormwater and TMDL Wasteload Allocations

Stormwater runoff is water from rain or snowmelt that does not immediately infiltrate into the ground and flows over or through natural or man-made storage or conveyance systems. When undeveloped areas are converted to land uses with impervious surfaces—such as buildings, parking lots, and roads—the natural hydrology of the land is altered and can result in increased surface runoff rates, volumes, and pollutant loads. Certain types of stormwater runoff are considered point source discharges for Clean Water Act purposes, including stormwater that is associated with municipal separate storm sewer systems (MS4s), industrial stormwater covered under the Multi-Sector General Permit (MSGP), and construction stormwater covered under the Construction General Permit (CGP). For more information about these permits and managing stormwater, see Appendix D.

5.6 Reserve for Growth

A growth reserve has not been included in this TMDL. The load capacity has been allocated to the existing sources in the watershed. Any new sources will need to obtain an allocation from the existing load allocation.

5.7 Protection of Downstream Waters

Idaho's water quality standards require that all waters "shall maintain a level of water quality at their pour point into downstream waters that provides for the attainment and maintenance of the water quality standards of those downstream waters, including waters of another state or tribe" (IDAPA 58.01.02.070.08). The TMDLs in the document are developed to achieve stream sediment equivalent to natural background conditions. The allocations in this TMDL are developed to achieve natural background sediment loads which are considered to be protective of beneficial uses and would not promote downstream sediment impairments.

AUs addressed in the sediment portion of this TMDL are tributary to the mainstem Henrys Fork. Twin Creek is tributary to the Henrys Fork River identified as the reach from the Henrys Lake

Dam to its confluence with Big Springs. Sand Creek is tributary to the Henrys Fork River identified as the reach from the Ashton Reservoir Dam to Falls Creek. Both of the Henrys Fork River AUs are fully supporting their beneficial uses of cold water aquatic life and salmonid spawning. The section of river that Twin Creek is tributary is also fully supporting beneficial uses of primary contact recreation and domestic water supply.

The Timber Creek AU addressed in this TMDL for *E. coli* impairment empties to Henrys Lake. Henrys Lake is not assessed for its designated uses of cold water aquatic life and secondary contact recreation.

5.8 Implementation Strategies

DEQ recognizes that implementation strategies for TMDLs may need to be modified if monitoring shows that TMDL goals are not being met or significant progress is not being made toward achieving the goals. Reasonable assurance (addressed in section 5.3) for the TMDL to meet water quality standards is based on the implementation strategy.

5.8.1 Time Frame

DEQ believes that a time frame of 5–10 years is required to begin the process of streambank stabilization and initial identification of diminished volumes of fine sediment. Given their smaller bankfull widths, smaller streams may reach targets sooner than larger streams. It is estimated that without new sediment inputs, the removal of the fines on the substrate and redevelopment of the thalweg will take approximately 5 years.

5.8.2 Approach

Funding provided under Clean Water Act §319 and other funds will be used to encourage voluntary projects to reduce nonpoint source pollution.

5.8.3 Responsible Parties

DEQ and the designated management agencies in Idaho have primary responsibility for overseeing implementation in cooperation with landowners and managers. In Idaho, these agencies, and their federal and state partners, are charged by the Clean Water Act to lend available technical assistance and other appropriate support to local efforts for water quality improvements. Designated state agencies are responsible for assisting with preparation of specific implementation plans, particularly for those resources for which they have regulatory authority or programmatic responsibilities:

- Idaho Department of Lands for timber harvest, oil and gas exploration and development, and mining
- Idaho Soil and Water Conservation Commission for grazing and agricultural activities
- Idaho Transportation Department for public road construction
- Idaho State Department of Agriculture for aquaculture
- DEQ for all other activities

In addition to the designated management agencies, the public—through the WAG and other equivalent organizations or processes—will have opportunities to be involved in developing the implementation plan to the maximum extent practical. Public participation will significantly affect public acceptance of the document and the proposed control actions. Stakeholders (e.g., landowners, local governing authorities, taxpayers, industries, and land managers) are the most educated regarding the pollutant sources and will be called upon to help identify the most appropriate control actions for each area. Experience has shown that the best and most effective implementation plans are those developed with substantial public cooperation and involvement.

5.8.4 Implementation Monitoring Strategy

The objectives of a monitoring strategy are to demonstrate long-term recovery, better understand natural variability, track project and BMP implementation, and track the effectiveness of TMDL implementation. This monitoring and feedback mechanism is a major component of the reasonable assurance component of the TMDL implementation plan.

Monitoring will provide information on progress being made toward achieving TMDL allocations and water quality standards and will help in the interim evaluation of progress, including in the development of 5-year reviews and future TMDLs.

The implementation plan, usually written within 18 months of EPA approval of a TMDL, will be tracked by accounting for the numbers, types, and locations of projects, BMPs, educational activities, or other actions taken to improve or protect water quality. Implementation plan monitoring will include watershed monitoring and BMP monitoring.

5.8.5 Pollutant Trading

Pollutant trading (also known as water quality trading) is a contractual agreement to exchange pollution reductions between two parties. Pollutant trading is a business-like way of helping to solve water quality problems by focusing on cost-effective, local solutions to problems caused by pollutant discharges to surface waters. Pollutant trading is one of the tools available to meet reductions called for in a TMDL where point and nonpoint sources both exist in a watershed. For additional information, see Appendix E.

6 Conclusions

AUs in the Upper and Lower Henrys Fork subbasins currently in Category 5 have a complex assortment of issues that have hampered timely completion of TMDLs. AUs contain stream segments that cross landform and land use type and AUs have been assessed with inappropriate methodologies. Reorganizing AUs will better represent stream conditions and will allow repeatable data collection activities.

Specifically, DEQ proposes two concurrent actions to rectify AU alignment in the Upper Henrys Fork subbasin while conducting field work and assessing stream conditions. The Henrys Lake Outlet AU (ID17040202SK025_02) and the Twin Creek AU (ID17040202SK030_02) should be split at the USFS boundary that intersects these AUs. The Henrys Lake Outlet AU contains stream segments in forested headwater hills within lands managed by the USFS that continue into unforested valley bottom meadows and irrigated pastures managed by the state or privately owned. The Twin Creek AU should be similarly split at the USFS boundary. The stream segment lengths within the Twin Creek AU that would be affected are relatively small; however, data collected in support of this TMDL show differences in stream function that are a result of landform and land use. SEIs collected in the Twin Creek AU show no excess sedimentation in segments found in forested hills but do show excess sedimentation in unforested valley bottom meadows with differing land management practices.

Errors in selecting assessment sites within the Upper and Lower Henrys Fork subbasins have created persistent listing issues for certain AUs. Field evidence from the Moose Creek AU (ID17040202SK022_02) supports a complete lack of sediment impairment, as there were no eroding banks on which to complete an SEI. This AU was likely listed in error for sediment due to inappropriate assessment techniques. Moose Creek is a low-gradient water body that does not have the typical gravel bottom of a mountain stream. This river should not have been monitored and assessed with the *Water Body Assessment Guidance* (DEQ 2016b) scoring thresholds. Moose Creek is unlike streams in the reference set used to establish impairment thresholds. Ideally, the AU should go to Category 3 in the Integrated Report as unassessed until appropriate assessment protocols are developed for these soft-bottom systems.

Another error in applying assessment site selection in the Upper and Lower Henrys Fork subbasins involves establishing BURP sites on nonperennial waters. DEQ's multimetric biological indices used to evaluate beneficial use support are not appropriate to apply in intermittent, dewatered, or ephemeral streams. In the 2nd order Conant Creek AU (ID17040203SK007_02), BURP sites were established in segments that are typically dry and do not support aquatic life beneficial uses or within stream reaches that had flows less than the optimum flow (1 cubic foot per second) for the application of numeric criteria. Seven attempts from 1996 to 2014 were made to assess stream conditions in the 2nd order Conant Creek AU. Water was only found once during the 1997 sampling year; however, the water present in two streams was estimated at or below the optimum flow. These flows were likely estimated because no flow equipment was noted in available BURP data. Based on the reported conditions in 1997, this AU should not have been assessed. The lack of permanent water in the AU precludes the establishment of viable aquatic communities. Ideally, this AU would go to Category 3 in the Integrated Report as an unassessed until appropriate assessment protocols are developed for these intermittent, dewatered, or ephemeral systems. Although persistent issues have complicated the TMDL process, several AUs in the subbasins have high-quality data available for beneficial use assessments.

Beneficial use assessments for the Timber Creek (ID17040202SK035_03), 3rd order Conant Creek (ID17040203SK007_03), and Sand Creek (ID17040203SK013_04) AUs were completed in 2015. The Timber Creek AU is listed as impaired for *E. coli*, while the 3rd order Conant Creek and Sand Creek AUs are listed for combined biota/habitat bioassessments.

Previously unaddressed bacteria data from the Timber Creek AU was used to calculate a TMDL within this document. Upon TMDL approval, this AU should be moved to Category 4a. Bacteria concentrations measured in 2003 indicated that a 43% reduction would be needed to meet Idaho water quality standards. Subsequent TMDL addendums and five-year reviews did not capture this data and the bacteria impairment in the Timber Creek AU was not accurately assessed. At this point, the 2003 data is the most current data that meets the standards for calculating the 30-day geometric mean required by Idaho rule. Four individual bacteria samples from Timber Creek in 2015 were found at levels unlikely to exceed the geometric mean criterion. Further data should be collected to calculate a true 30-day geometric mean and determine beneficial use support for this AU.

Data from the 3rd order Conant Creek and Sand Creek AUs present differing delisting scenarios. The 3rd order Conant Creek AU was listed in Category 5 based on 2010 data; however, 2013 and 2014 BURP data show passing scores of measured indices. Coldwater fish species and juvenile fish were captured during 2014 fish sampling; indicating 3rd order Conant Creek is supporting cold water aquatic life and salmonid spawning. Additionally, SEI data collection conducted near the 2013 and 2014 BURP locations showed no excessive streambank erosion. This AU should be delisted for combined biota/habitat bioassessment and placed in Category 2 as supporting beneficial uses. The Sand Creek AU is the only Category 5 AU in the Upper and Lower Henrys Fork subbasins that has been properly assessed with an identifiable impairment and addressed by a TMDL. Until AUs within the Upper and Lower Henrys Fork subbasins can be reorganized, a TMDL was created for the Twin Creek AU to understand the magnitude of impairment.

SEI data were collected in 2015 at the Twin Creek and Sand Creek AUs. Three locations in Twin Creek were investigated for sediment impairment. Two SEI locations and a 2004 BURP location in the forested hills portion of this AU indicate no impairment from excess sedimentation. A third SEI location in the unforested valley bottom indicates a stream sediment load of up to 7 tons per year greater than what could be considered as natural background conditions. In the Sand Creek AU, SEI data were collected in 2015 at two locations within the upper portion of this AU. Data from one SEI location and 2004 BURP data indicate no impairment from excessive streambank erosion and streambanks are categorized as stable and covered. The other SEI location indicated a load reduction of up to 15 tons per year is needed.

Upon approval, the Twin Creek and Sand Creek AUs should be delisted from Category 5 for combined biota/habitat bioassessments and placed in Category 4a with a TMDL for sedimentation impairments. Table 11 summarizes the AUs and recommendations for the next Integrated Report.

Table 11. Summary of assessment outcomes and proposed changes to AU alignment in next integrated report.

Assessment Unit Name	Assessment Unit Number	Pollutant	TMDLs Completed	Recommended Changes to Next Integrated Report	Justification
Upper Henrys Fork					
Moose Creek—source to confluence with Henrys Fork	ID17040202SK022_02	Combined biota/habitat bioassessments	No	Include in Category 3 Delist from Category 5	Improper assessment of low-gradient, soft-bottomed stream with no riffles. Does not qualify in a sampleable category for BURP assessment.
Henrys Lake Outlet—USFS boundary to mouth	ID17040202SK025_02	Combined biota/habitat bioassessments	No	Retain in Category 5	Previous mapping error incorrectly associated this AU with portions of the Twin Creek Watershed. AU was split to align stream segments within similar landform and use. Valley bottom streams appear to be hydrologically modified and require additional assessments. No data available to confirm impairment. AU should be reassessed and 5-year review period to confirm use support for newly aligned AU.
Henrys Lake Outlet – Henrys Lake Dam to USFS boundary	ID17040202SK025_02a		No	Include in Category 5 for combined biota/habitat assessments	Failing 2014 BURP score indicates designated beneficial uses of cold water aquatic life and salmonid spawning are not being supported.
Twin Creek—USFS boundary to mouth	ID17040202SK030_02	Combined biota/habitat bioassessments	Yes	Delist from Category 5 Delist for combined biota/habitat assessments Include in Category 4a for Sedimentation	AU was split to align stream segments within similar landform and land use. Sediment TMDL completed based on SEI. Sedimentation replaces combined biota/habitat assessments as cause. The AU correction establish lower portions of Twin Creek as a separate AU that were previously included in AU SK025_02
Twin Creek -- source to USFS boundary	ID17040202SK030_02a		No	Include in Category 2	BURP scores from 2014 and 2019 indicate full support of cold water aquatic life use. Portion of Twin Creek AU within USFS Boundaries
Timber Creek—source to mouth	ID17040202SK035_03	*Escherichia coli*	Yes	Include in Category 4a for *Escherichia coli*	Bacteria TMDL completed based on 30 day geometric mean concentrations.
Lower Henrys Fork					
Conant Creek—Idaho/Wyoming border to mouth	ID17040203SK007_02	Combined biota/habitat bioassessments	No	Include in Category 3 Delist from Category 5	Improper assessment of intermittent, dewatered, or ephemeral stream. Does not qualify in a sampleable category for BURP assessment.

Conant Creek—Idaho/Wyoming border to mouth	ID17040203SK007_03	Combined biota/habitat bioassessments	No	Include in Category 2 Delist from Category 5	Recent BURP data suggest support of beneficial uses.
Sand Creek—Pine Creek to mouth	ID17040203SK013_04	Combined biota/habitat bioassessments	Yes	Delist for combined biota/habitat assessments Include in Category 4a for sedimentation	Sediment TMDL completed based on SEI. Sedimentation replaces combined biota/habitat assessments as cause.

This document was prepared with input from the public, as described in Appendix F. Following the public comment period, comments and DEQ responses will also be included in this appendix, and a distribution list will be included in Appendix G.

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GIS Coverages

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Glossary

§303(d)	Refers to section 303 subsection "d" of the Clean Water Act. Section 303(d) requires states to develop a list of water bodies that do not meet water quality standards. This section also requires total maximum daily loads (TMDLs) be prepared for listed waters. Both the list and the TMDLs are subject to United States Environmental Protection Agency approval.
Assessment Unit (AU)	A group of similar streams that have similar land use practices, ownership, or land management. However, stream order is the main basis for determining AUs. All the waters of the state are defined using AUs, and because AUs are a subset of water body identification numbers, they tie directly to the water quality standards so that beneficial uses defined in the water quality standards are clearly tied to streams on the landscape.
Beneficial Use	Any of the various uses of water that are recognized in water quality standards, including, but not limited to, aquatic life, recreation, water supply, wildlife habitat, and aesthetics.
Beneficial Use Reconnaissance Program (BURP)	A program for conducting systematic biological and physical habitat surveys of water bodies in Idaho. BURP protocols address lakes, reservoirs, and wadeable streams and rivers.
Exceedance	A violation (according to DEQ policy) of the pollutant levels permitted by water quality criteria.
Fully Supporting	In compliance with water quality standards and within the range of biological reference conditions for all designated and existing beneficial uses as determined through the *Water Body Assessment Guidance* (DEQ 2016b).
Load Allocation (LA)	A portion of a water body's load capacity for a given pollutant that is given to a particular nonpoint source (by class, type, or geographic area).
Load	The quantity of a substance entering a receiving stream, usually expressed in pounds or kilograms per day or tons per year. Load is the product of flow (discharge) and concentration.
Load Capacity (LC)	How much pollutant a water body can receive over a given period without causing violations of state water quality standards. Upon allocation to various sources, a margin of safety, and natural background contributions, it becomes a total maximum daily load.
Margin of Safety (MOS)	An implicit or explicit portion of a water body's load capacity set aside to allow for uncertainly about the relationship between the pollutant loads and the quality of the receiving water body. The margin of safety is a required component of a total maximum daily load (TMDL) and is often incorporated into conservative assumptions used to develop the TMDL (generally within the calculations and/or models). The margin of safety is not allocated to any sources of pollution.

Nonpoint Source	A dispersed source of pollutants generated from a geographical area when pollutants are dissolved or suspended in runoff and then delivered into waters of the state. Nonpoint sources are without a discernable point or origin. They include, but are not limited to, irrigated and nonirrigated lands used for grazing, crop production, and silviculture; rural roads; construction and mining sites; log storage or rafting; and recreation sites.
Not Assessed (NA)	A concept and an assessment category describing water bodies that have been studied but are missing critical information needed to complete an assessment.
Not Fully Supporting	Not in compliance with water quality standards or not within the range of biological reference conditions for any beneficial use as determined through the *Water Body Assessment Guidance* (DEQ 2016b).
Point Source	A source of pollutants characterized by having a discrete conveyance, such as a pipe, ditch, or other identifiable “point” of discharge into a receiving water. Common point sources of pollution are industrial and municipal wastewater plants.
Pollutant	Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.
Pollution	A very broad concept that encompasses human-caused changes in the environment that alter the functioning of natural processes and produce undesirable environmental and health effects. Pollution includes human-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.
Stream Order	Hierarchical ordering of streams based on the degree of branching. A 1st order stream is an unforked or unbranched stream. Under Strahler’s (1957) system, higher order streams result from the joining of two streams of the same order.
Total Maximum Daily Load (TMDL)	A TMDL is a water body’s load capacity after it has been allocated among pollutant sources. It can be expressed on a time basis other than daily if appropriate. Sediment loads, for example, are often calculated on an annual basis. A TMDL is equal to the load capacity, such that load capacity = margin of safety + natural background + load allocation + wasteload allocation = TMDL. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several water bodies and/or pollutants within a given watershed.
Wasteload Allocation (WLA)	The portion of receiving water’s load capacity that is allocated to one of its existing or future point sources of pollution. Wasteload allocations specify how much pollutant each point source may release to a water body.
Water Body	A stream, river, lake, estuary, coastline, or other water feature, or portion thereof.

Water Quality Criteria	Levels of water quality expected to render a body of water suitable for its designated uses. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, aquatic habitat, or industrial processes.
Water Quality Standards	State-adopted and United States Environmental Protection Agency-approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses.

Appendix A. Beneficial Uses

Idaho water quality standards (IDAPA 58.01.02) list beneficial uses and set water quality goals. Idaho water quality standards require that surface waters be protected for beneficial uses wherever attainable (IDAPA 58.01.02.050.02). These beneficial uses are interpreted as existing uses, designated uses, and presumed uses.

Existing Uses

Existing uses under the Clean Water Act are "those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards" (40 CFR 131.3). The existing instream water uses and the level of water quality necessary to protect the uses shall be maintained and protected (IDAPA 58.01.02.051.01). Existing uses need to be protected, whether or not the level of water quality to fully support the uses currently exists. A practical application of this concept would be to apply the existing use of salmonid spawning to a water that supported salmonid spawning since November 28, 1975, but does not now due to other factors, such as blockage of migration, channelization, sedimentation, or excess heat.

Designated Uses

Designated uses under the Clean Water Act are "those uses specified in water quality standards for each water body or segment, whether or not they are being attained" (40 CFR 131.3). Designated uses are simply uses officially recognized by the state. In Idaho, these include uses such as aquatic life support, recreation in and on the water, domestic water supply, and agricultural uses. Multiple uses often apply to the same water; in this case, water quality must be sufficiently maintained to meet the most sensitive use (designated or existing). Designated uses may be added or removed using specific procedures provided for in state law, but the effect must not be to preclude protection of an existing higher quality use such as cold water aquatic life or salmonid spawning. Designated uses are described in the Idaho water quality standards (IDAPA 58.01.02.100) and specifically listed by water body in sections 110–160.

Undesignated Surface Waters and Presumed Use Protection

In Idaho, due to a change in scale of cataloging waters in 2000, most water bodies listed in the tables of designated uses in the water quality standards do not yet have specific use designations (IDAPA 58.01.02.110–160). The water quality standards have three sections that address nondesignated waters. Sections 101.02 and 101.03 specifically address nondesignated man-made waterways and private waters. Man-made waterways and private waters have no presumed use protections. Man-made waters are protected for the use for which they were constructed unless otherwise designated in the water quality standards. Private waters are not protected for any beneficial uses unless specifically designated in the water quality standards.

All other undesignated waters are addressed by section 101.01. Under this section, absent information on existing uses, DEQ presumes that most Idaho waters will support cold water aquatic life and either primary or secondary contact recreation (IDAPA 58.01.02.101.01). To protect these so-called presumed uses, DEQ applies the numeric cold water and recreation criteria to undesignated waters. If in addition to presumed uses, an additional existing use (e.g., salmonid spawning) exists, then the additional numeric criteria for salmonid spawning would also apply (e.g., intergravel dissolved oxygen, temperature) because of the requirement to protect water quality for that existing use. However, if some other use that requires less stringent criteria for protection (such as seasonal cold aquatic life) is found to be an existing use, then a use designation (rulemaking) is needed before that use can be applied in lieu of cold water criteria (IDAPA 58.01.02.101.01).

Appendix B. State and Site-Specific Water Quality Standards and Criteria

Table B1. Selected numeric criteria supportive of designated beneficial uses in Idaho water quality standards.

Parameter	Primary Contact Recreation	Secondary Contact Recreation	Cold Water Aquatic Life	Salmonid Spawning[a]
Water Quality Standards: IDAPA 58.01.02.250–251				
Bacteria				
• Geometric mean	<126 *E. coli*/100 mL[b]	<126 *E. coli*/100 mL	—	—
• Single sample	≤406 *E. coli*/100 mL	≤576 *E. coli*/100 mL	—	—
pH	—	—	Between 6.5 and 9.0	Between 6.5 and 9.5
Dissolved oxygen (DO)	—	—	DO exceeds 6.0 milligrams/liter (mg/L)	**Water Column DO**: DO exceeds 6.0 mg/L in water column or 90% saturation, whichever is greater **Intergravel DO**: DO exceeds 5.0 mg/L for a 1-day minimum and exceeds 6.0 mg/L for a 7-day average
Temperature[c]	—	—	22 °C or less daily maximum; 19 °C or less daily average **Seasonal Cold Water**: Between summer solstice and autumn equinox: 26 °C or less daily maximum; 23 °C or less daily average	13 °C or less daily maximum; 9 °C or less daily average **Bull Trout**: Not to exceed 13 °C maximum weekly maximum temperature over warmest 7-day period, June–August; not to exceed 9 °C daily average in September and October
Turbidity	—	—	Turbidity shall not exceed background by more than 50 nephelometric turbidity units (NTUs) instantaneously or more than 25 NTUs for more than 10 consecutive days.	—
Ammonia	—	—	Ammonia not to exceed calculated concentration based on pH and temperature.	—
EPA Bull Trout Temperature Criteria: Water Quality Standards for Idaho, 40 CFR Part 131				
Temperature	—	—	—	7-day moving average of 10 °C or less maximum daily temperature for June–September

[a] During spawning and incubation periods for inhabiting species
[b] *Escherichia coli* per 100 milliliters
[c] Temperature exemption: Exceeding the temperature criteria will not be considered a water quality standard violation when the air temperature exceeds the ninetieth percentile of the 7-day average daily maximum air temperature calculated in yearly series over the historic record measured at the nearest weather reporting station.

Appendix C. Data Sources

In 2015, DEQ collected streambank stability data and measurements to determine the cause of impairment for the Upper and Lower Henrys Fork subbasins. This appendix includes calculations, maps, photographs, and field notes documenting that work.

Table C1. Data sources for Upper and Lower Henrys Fork subbasin assessment.

Water Body/Area	Data Source	Type of Data	Collection Date
Moose Creek	M. Shumar and Jack M.	SEI	June 2015
Twin Creek	M. Shumar and Jack M.	SEI	June 2015
Conant Creek	M. Shumar and Jack M.	SEI	June 2015
Sand Creek	M. Shumar and Jack M.	SEI	June 2015

Table C2. Streambank erosion inventory calculation sheet for Moose Creek (ID17040202SK022_02).

STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET

Stream:	Moose Creek	**Stream Segment Location (DD)**	
Assessment Unit:	ID17040202SK022_02	***Upstream N***	44.485160
Segment Inventoried:	Reach 1	***W***	-111.286020
Total Reach:	219m (718.5 ft)	***Downstream N***	44.485600
Date Collected:	16-Sep-15	***W***	-111.287560
Field Crew:	Jack M. & M. Shumar	**Notes:**	low gradient depositional, E channel: no eroding banks measured.
Data Reduced By:	M. Shumar		

Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flowpath distance)	718.50	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	85	lb/ft^3	Total Reach
Length of Similar Stream	5305	ft	Total Reach
Estimated Distance inventoried	1437.00	ft	"
Total Erosive Bank Length	0.00	ft	"
Percent Erosive Bank	0.0	%	"
Eroding Area (AE)	0.00	ft^2	"
Lateral Recession Rate (RLR)	0.04		"
Bank Erosion (E)	0.00	tons/year	"
Total Bank Erosion Rate (ER)	0.00	tons/mile/year	Reach and Segment
Total Bank Erosion	0.00	tons/year	"

Recession Rate Calculations		
Factor	**Field Stability Score**	**Erosion Severity Reduction**
Bank Erosion Evidence (0 to 3)	0.25	0.25
Bank Stability Condition (0 to 3)	0.25	0.25
Bank Cover/Vegetation(0 to 3)	0	0.25
Lateral Channel Stability (0 to 3)	1	0.25
Channel Bottom Stability (0 to 2)	0.5	0.25
In-Channel Deposition (-1 to 1)	1	0
Total = Slight (0-4); Moderate (4-8); Severe (>8)	3	1.25
Lateral Recession Rate (RLR) (ft/yr)	**0.04**	**0.0225**

Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)	0.00	ft^2	Inventoried Segment
Bank Erosion at Load Capacity (E)	0.00	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	0.00	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	0.00	tons/year	Total Reach

Summary of Loads					
Current Load		**Load Capacity**			
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Load Reduction Required?	Margin of Safety (tons/yr)
0.0	**0.0**	**0.0**	**0.0**	**No**	**0**

Percent Erosion Reduction (%)	**0**
Total Erosion Reduction (tons/yr)	**0**

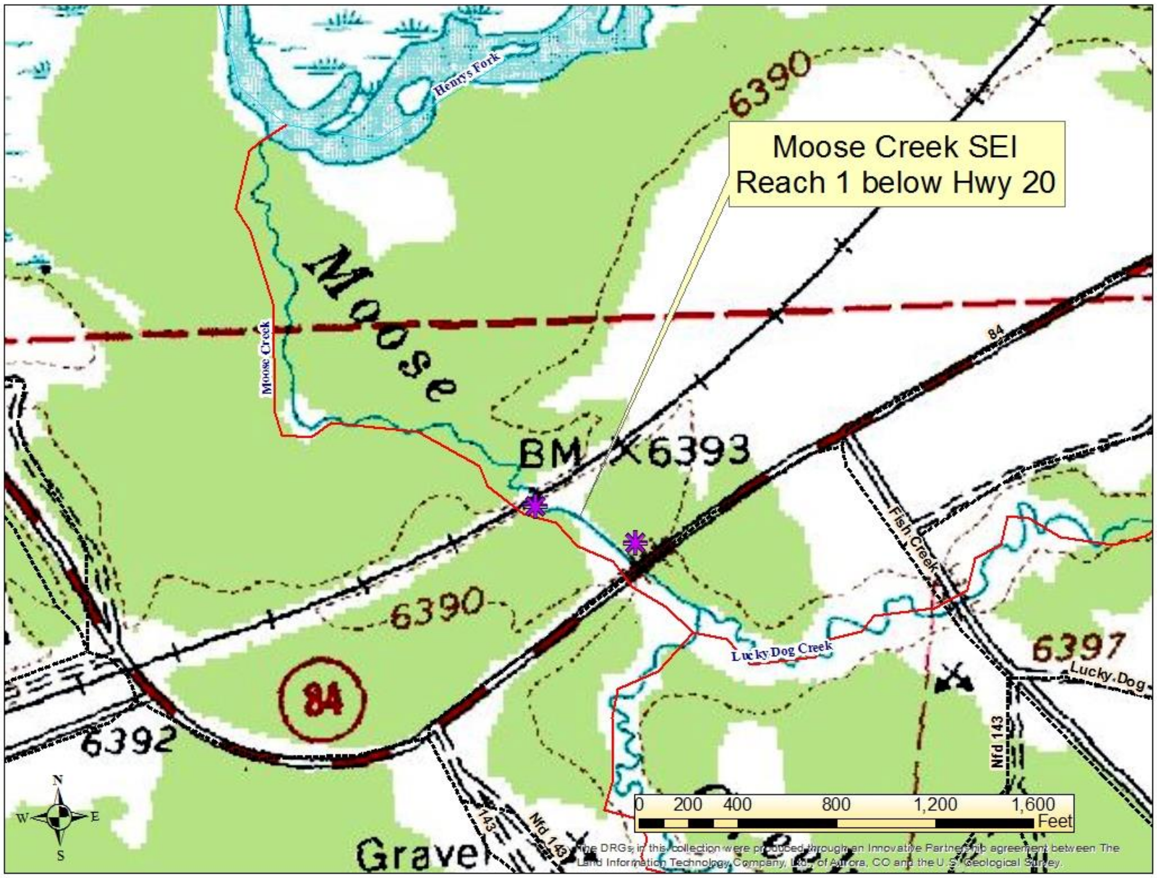
Moose Creek SEI
Reach 1 below Hwy 20
Henrys Fork
Moose
Moose Creek
BM X6393
6390
6390
6392
6397
84
Fish Creek
Lucky Dog Creek
Lucky Dog
Nfd 143
Grave
0 200 400 800 1,200 1,600
Feet
N
S
E
W

Table C3. Streambank erosion inventory calculation sheet for Moose Creek (ID17040202SK022_02).

STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET

Stream:	Moose Creek	**Stream Segment Location (DD)**	
Assessment Unit:	ID17040202SK022_02	***Upstream N***	44.458180
Segment Inventoried:	Reach 2 on Chick Cr Flat Road	***W***	-111.231310
Total Reach:	230m (754.5 ft)	***Downstream N***	44.459700
Date Collected:	16-Jun-15	***W***	-111.230930
Field Crew:	Jack M & M. Shumar	**Notes:**	low gradient, depositional meadow, E channel. No eroding banks measured.
Data Reduced By:	M. Shumar		

Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flowpath distance)	754.50	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	85	lb/ft^3	Total Reach
Length of Similar Stream	10925	ft	Total Reach
Estimated Distance inventoried	1509.00	ft	"
Total Erosive Bank Length	0.00	ft	"
Percent Erosive Bank	0.0	%	"
Eroding Area (AE)	0.00	ft^2	"
Lateral Recession Rate (RLR)	0.025		"
Bank Erosion (E)	0.00	tons/year	"
Total Bank Erosion Rate (ER)	0.00	tons/mile/year	Reach and Segment
Total Bank Erosion	0.00	tons/year	"

Recession Rate Calculations		
Factor	**Field Stability Score**	**Erosion Severity Reduction**
Bank Erosion Evidence (0 to 3)	0	0.25
Bank Stability Condition (0 to 3)	0.25	0.25
Bank Cover/Vegetation(0 to 3)	0.25	0.25
Lateral Channel Stability (0 to 3)	0.25	0.25
Channel Bottom Stability (0 to 2)	0.5	0.25
In-Channel Deposition (-1 to 1)	0.25	0
Total = Slight (0-4); Moderate (4-8); Severe (>8)	1.5	1.25
Lateral Recession Rate (RLR) (ft/yr)	**0.025**	**0.0225**

Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)	0.00	ft^2	Inventoried Segment
Bank Erosion at Load Capacity (E)	0.00	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	0.00	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	0.00	tons/year	Total Reach

Summary of Loads					
Current Load		**Load Capacity**			
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Load Reduction Required?	Margin of Safety (tons/yr)
0.0	**0.0**	**0.0**	**0.0**	**No**	**0**

Percent Erosion Reduction (%)	**0**
Total Erosion Reduction (tons/yr)	**0**

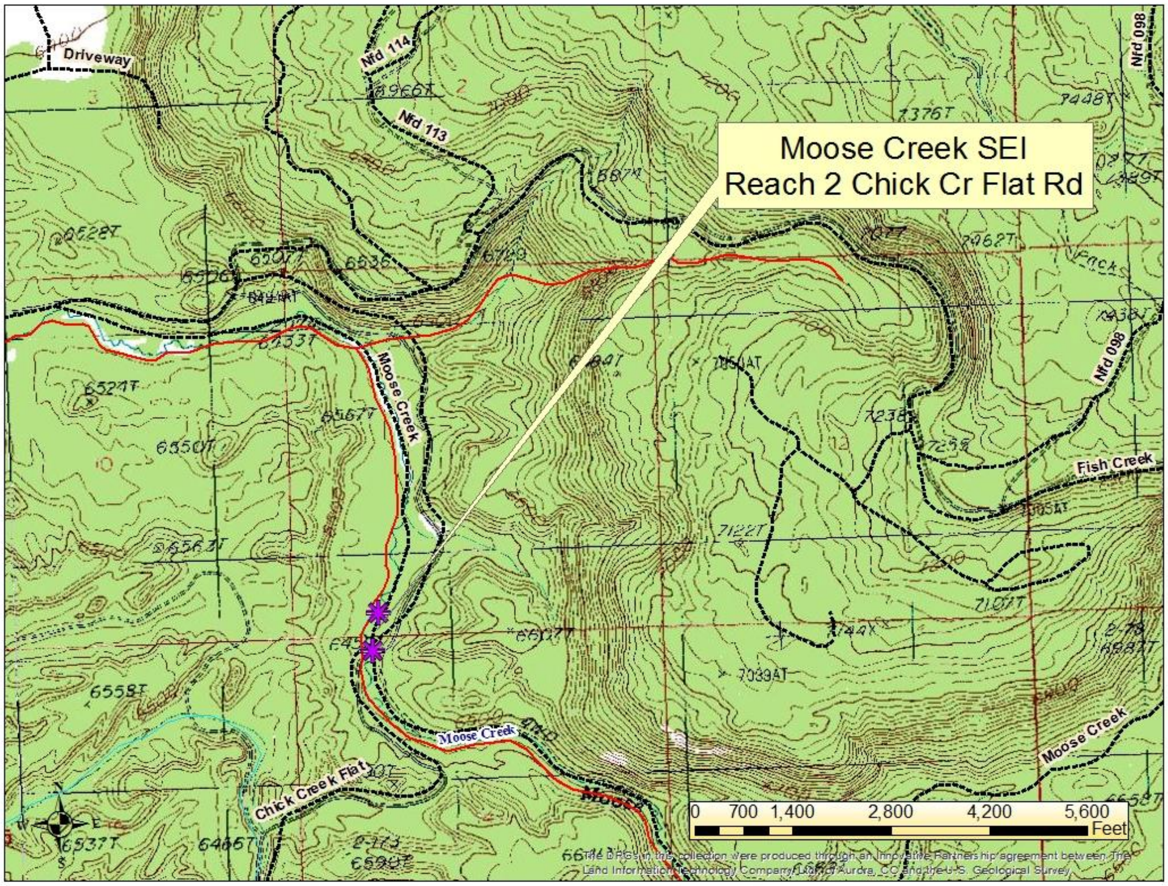
Moose Creek SEI
Reach 2 Chick Cr Flat Rd
Driveway
Nfd 114
Nfd 113
Nfd 098
Moose Creek
Fish Creek
Moose Creek
Moose Creek
Chick Creek Flat
0 700 1,400 2,800 4,200 5,600
Feet

Table C4. Streambank erosion inventory calculation sheet for Twin Creek (ID17040202SK030_02a).

STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET

Stream:	Twin Creek	**Stream Segment Location (DD)**	
Assessment Unit:	ID17040202SK030_02	***Upstream N***	44.589970
Segment Inventoried:	Reach 1 East Branch FS boundary	***W***	-111.314120
Total Reach:	281m (922 ft)	***Downstream N***	44.588500
Date Collected:	17-Jun-15	***W***	-111.315870
Field Crew:	Jack M. & M. Shumar	**Notes:**	C Channel on forest edge
Data Reduced By:	M. Shumar		

Current Load Streambank Erosion Calculations		**Unit**	**Area Applied**
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flow path distance)	922.00	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	85	lb/ft^3	Total Reach
Length of Similar Stream	3280	ft	Total Reach
Estimated Distance inventoried	1844.00	ft	"
Total Erosive Bank Length	65.00	ft	"
Percent Erosive Bank	3.5	%	"
Eroding Area (AE)	96.89	ft^2	"
Lateral Recession Rate (RLR)	0.035		"
Bank Erosion (E)	0.14	tons/year	"
Total Bank Erosion Rate (ER)	0.83	tons/mile/year	Reach and Segment
Total Bank Erosion	0.51	tons/year	"

Recession Rate Calculations		
Factor	**Field Stability Score**	**Erosion Severity Reduction**
Bank Erosion Evidence (0 to 3)	0.25	0.25
Bank Stability Condition (0 to 3)	0.5	0.25
Bank Cover/Vegetation(0 to 3)	0.25	0.25
Lateral Channel Stability (0 to 3)	1	0.25
Channel Bottom Stability (0 to 2)	0	0.25
In-Channel Deposition (-1 to 1)	0.5	0
Total = Slight (0-4); Moderate (4-8); Severe (>8)	2.5	1.25
Lateral Recession Rate (RLR) (ft/yr)	**0.035**	**0.0225**

Load Capacity Streambank Erosion Calculations for Total Reach		**Unit**	**Area Applied**
Eroding Area at Load Capacity (AE)	549.74	ft^2	Inventoried Segment
Bank Erosion at Load Capacity (E)	0.53	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	3.01	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	1.87	tons/year	Total Reach

Summary of Loads					
Current Load		**Load Capacity**			
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Load Reduction Required?	Margin of Safety (tons/yr)
0.8	**0.5**	**3.0**	**1.9**	**No**	**0**

Percent Erosion Reduction (%)	**0**
Total Erosion Reduction (tons/yr)	**0**

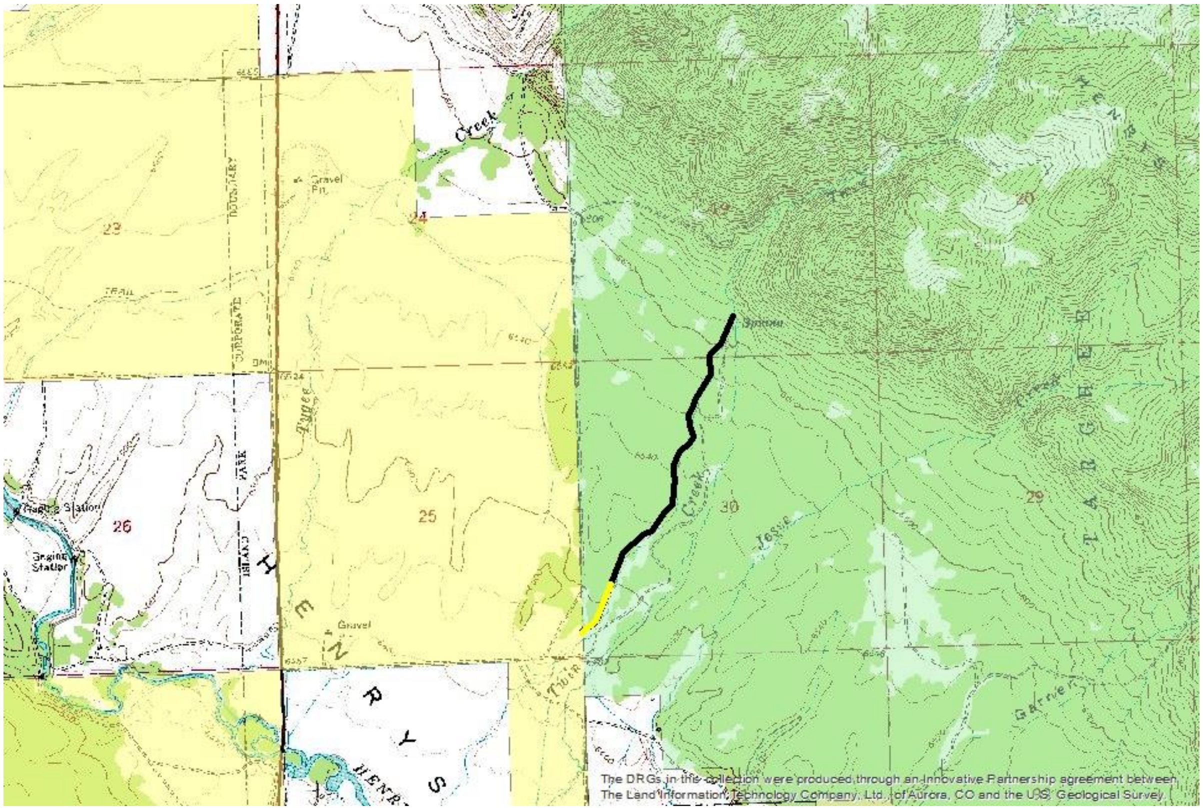
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Table C5. Streambank erosion inventory calculation sheet for Twin Creek (ID17040202SK030_02a).

STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET

Stream:	Twin Creek	**Stream Segment Location (DD)**	
Assessment Unit:	ID17040202SK030_02	***Upstream N***	44.590900
Segment Inventoried:	Reach 2 West Branch FS boundary	***W***	-111.314960
Total Reach:	150m (492 ft)	***Downstream N***	44.590330
Date Collected:	17-Jun-15	***W***	-111.315980
Field Crew:	Jack M. & M. Shumar	**Notes:**	C channel forest edge
Data Reduced By:	M. Shumar		

Current Load Streambank Erosion Calculations		**Unit**	**Area Applied**
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flowpath distance)	492.00	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	85	lb/ft^3	Total Reach
Length of Similar Stream	4015	ft	Total Reach
Estimated Distance inventoried	984.00	ft	"
Total Erosive Bank Length	13.10	ft	"
Percent Erosive Bank	1.3	%	"
Eroding Area (AE)	16.04	ft^2	"
Lateral Recession Rate (RLR)	0.02		"
Bank Erosion (E)	0.01	tons/year	"
Total Bank Erosion Rate (ER)	0.15	tons/mile/year	Reach and Segment
Total Bank Erosion	0.11	tons/year	"

Recession Rate Calculations		
Factor	**Field Stability Score**	**Erosion Severity Reduction**
Bank Erosion Evidence (0 to 3)	0.25	0.25
Bank Stability Condition (0 to 3)	0.25	0.25
Bank Cover/Vegetation(0 to 3)	0.25	0.25
Lateral Channel Stability (0 to 3)	0.25	0.25
Channel Bottom Stability (0 to 2)	0	0.25
In-Channel Deposition (-1 to 1)	0	0
Total = Slight (0-4); Moderate (4-8); Severe (>8)	1	1.25
Lateral Recession Rate (RLR) (ft/yr)	**0.02**	**0.0225**

Load Capacity Streambank Erosion Calculations for Total Reach		**Unit**	**Area Applied**
Eroding Area at Load Capacity (AE)	240.97	ft^2	Inventoried Segment
Bank Erosion at Load Capacity (E)	0.23	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	2.47	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	1.88	tons/year	Total Reach

Summary of Loads					
Current Load		**Load Capacity**			
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Load Reduction Required?	Margin of Safety (tons/yr)
0.1	**0.1**	**2.5**	**1.9**	**No**	**0**

Percent Erosion Reduction (%)	**0**
Total Erosion Reduction (tons/yr)	**0**

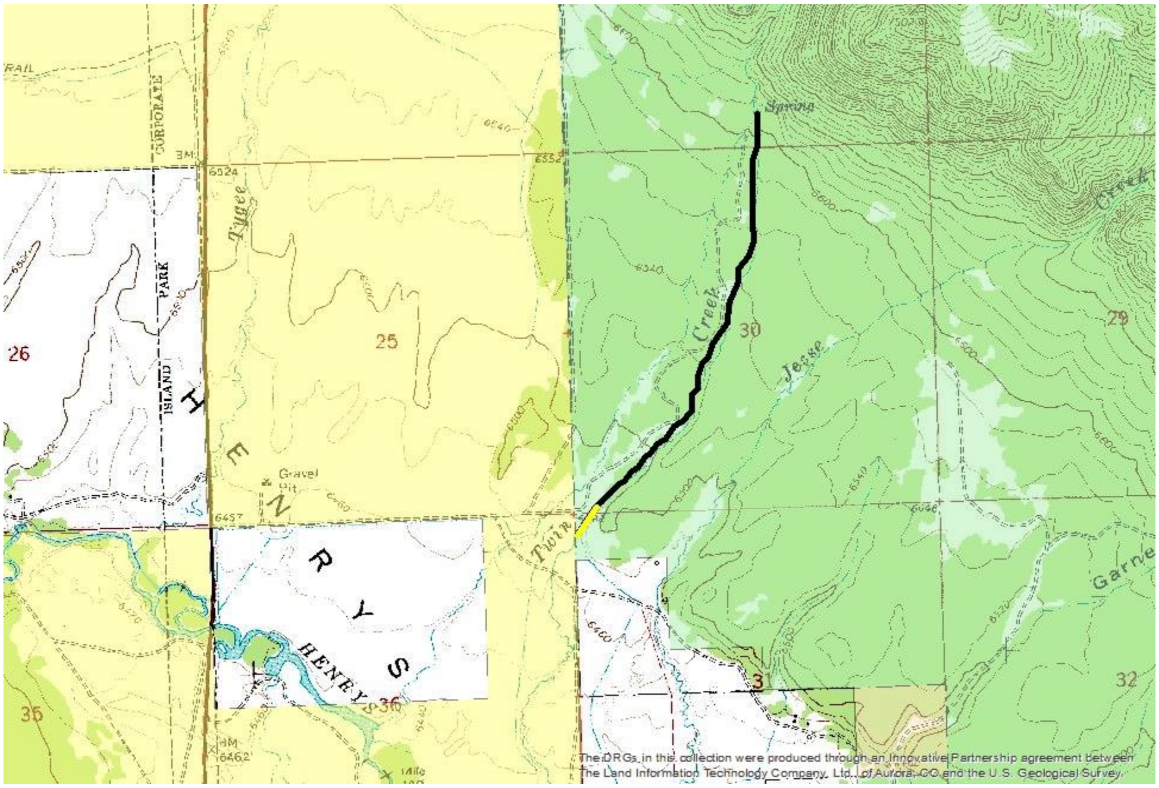
26
25
30
29
35
36
32
HENRYS
Jesse
Creek
Twin
Garne
Gravel Pit
ISLAND
PARK
CORPORATE
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Table C6. Streambank erosion inventory calculation sheet for Twin Creek (ID17040202SK030_02).

STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET

Stream:	Twin Creek	Stream Segment Location (DD)	
Assessment Unit:	ID17040202SK030_02	*Upstream N*	44.590330
Segment Inventoried:	Reach 3 State Land	*W*	-111.315980
Total Reach:	195m (640 ft)	*Downstream N*	44.589400
Date Collected:	17-Jun-15	*W*	-111.317570
Field Crew:	Jack M. & M. Shumar	Notes:	C Channel, meadow.
Data Reduced By:	M. Shumar		

Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flow path distance)	640.00	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	85	lb/ft^3	Total Reach
Length of Similar Stream	4746	ft	Total Reach
Estimated Distance inventoried	1280.00	ft	"
Total Erosive Bank Length	341.10	ft	"
Percent Erosive Bank	26.6	%	"
Eroding Area (AE)	394.48	ft^2	"
Lateral Recession Rate (RLR)	0.0675		"
Bank Erosion (E)	1.13	tons/year	"
Total Bank Erosion Rate (ER)	9.34	tons/mile/year	Reach and Segment
Total Bank Erosion	8.39	tons/year	"

Recession Rate Calculations		
Factor	**Field Stability Score**	**Erosion Severity Reduction**
Bank Erosion Evidence (0 to 3)	1.5	0.25
Bank Stability Condition (0 to 3)	1.5	0.25
Bank Cover/Vegetation(0 to 3)	1	0.25
Lateral Channel Stability (0 to 3)	1	0.25
Channel Bottom Stability (0 to 2)	0	0.25
In-Channel Deposition (-1 to 1)	0.25	0
Total = Slight (0-4); Moderate (4-8); Severe (>8)	5.25	1.25
Lateral Recession Rate (RLR) (ft/yr)	**0.0675**	**0.0225**

Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)	296.06	ft^2	Inventoried Segment
Bank Erosion at Load Capacity (E)	0.28	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	2.34	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	2.10	tons/year	Total Reach

Summary of Loads					
Current Load		**Load Capacity**			
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Load Reduction Required?	Margin of Safety + Natural Background (tons/yr)
9.3	**8.4**	**2.3**	**2.1**	YES	**0.63**

Percent Erosion Reduction (%)	**82**
Total Erosion Reduction (tons/yr)	**6.92**

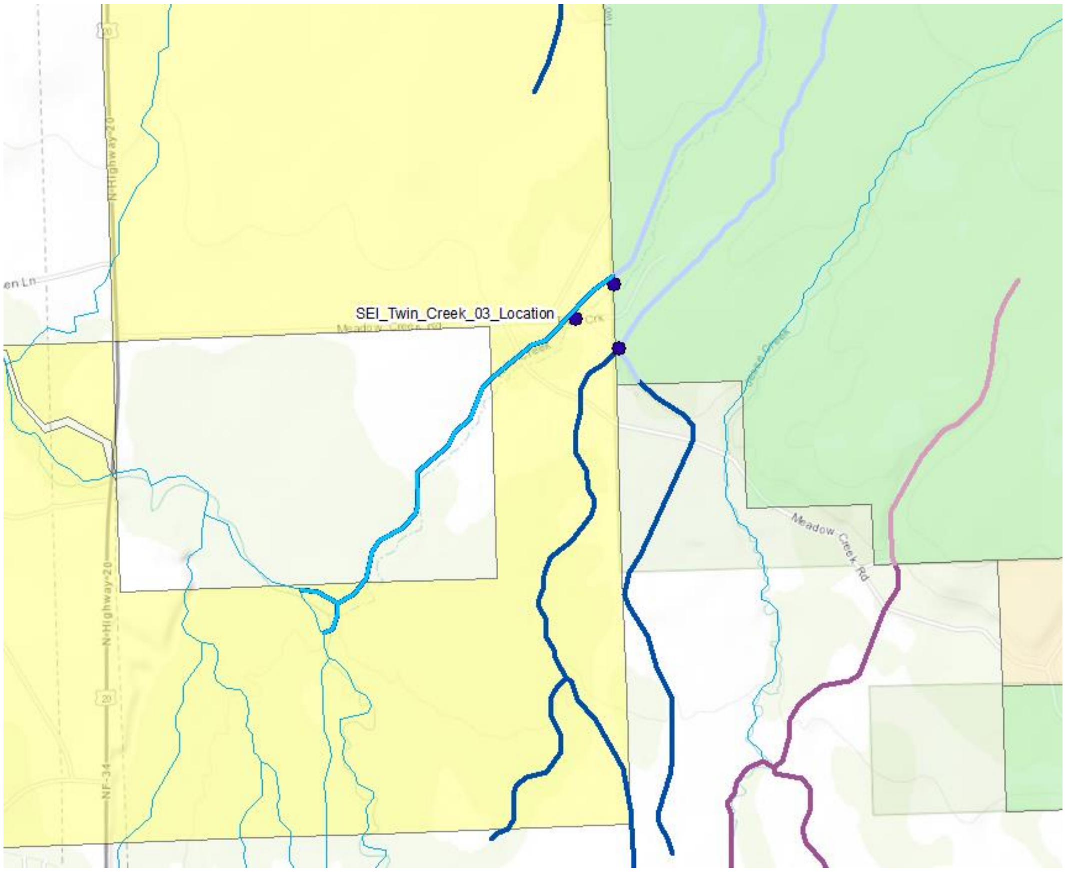

SEI_Twin_Creek_03_Location
Meadow Creek Rd
N Highway 20
NF-34

Table C7. Streambank erosion inventory calculation sheet for Conant Creek (ID17040203SK007_03).

STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET

Stream:	Conant Creek	**Stream Segment Location (DD)**	
Assessment Unit:	ID 17040203SK007_03	***Upstream N***	44.005150
Segment Inventoried:	downstream of Granite Creek	***W***	-111.149080
Total Reach:	617 meters (2024 ft)	***Downstream N***	44.004390
Date Collected:	16-Jun-15	***W***	-111.153760
Field Crew:	Jack M. & M. Shumar	**Notes:**	Rosgen C channel
Data Reduced By:	M. Shumar		

Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flowpath distance)	2024.00	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	85	lb/ft^3	Total Reach
Length of Similar Stream	6939	ft	Total Reach
Estimated Distance inventoried	4048.00	ft	"
Total Erosive Bank Length	211.70	ft	"
Percent Erosive Bank	5.2	%	"
Eroding Area (AE)	404.15	ft^2	"
Lateral Recession Rate (RLR)	0.0525		"
Bank Erosion (E)	0.90	tons/year	"
Total Bank Erosion Rate (ER)	2.35	tons/mile/year	Reach and Segment
Total Bank Erosion	3.09	tons/year	"

Recession Rate Calculations		
Factor	**Field Stability Score**	**Erosion Severity Reduction**
Bank Erosion Evidence (0 to 3)	1.25	0.25
Bank Stability Condition (0 to 3)	1	0.25
Bank Cover/Vegetation(0 to 3)	0.5	0.25
Lateral Channel Stability (0 to 3)	1	0.25
Channel Bottom Stability (0 to 2)	0	0.25
In-Channel Deposition (-1 to 1)	0.5	0
Total = Slight (0-4); Moderate (4-8); Severe (>8)	4.25	1.25
Lateral Recession Rate (RLR) (ft/yr)	**0.0525**	**0.0225**

Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)	1545.58	ft^2	Inventoried Segment
Bank Erosion at Load Capacity (E)	1.48	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	3.86	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	5.07	tons/year	Total Reach

Summary of Loads					
Current Load		**Load Capacity**			
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Load Reduction Required?	Margin of Safety (tons/yr)
2.4	**3.1**	**3.9**	**5.1**	**No**	**0**

Percent Erosion Reduction (%)	**0**
Total Erosion Reduction (tons/yr)	**0**

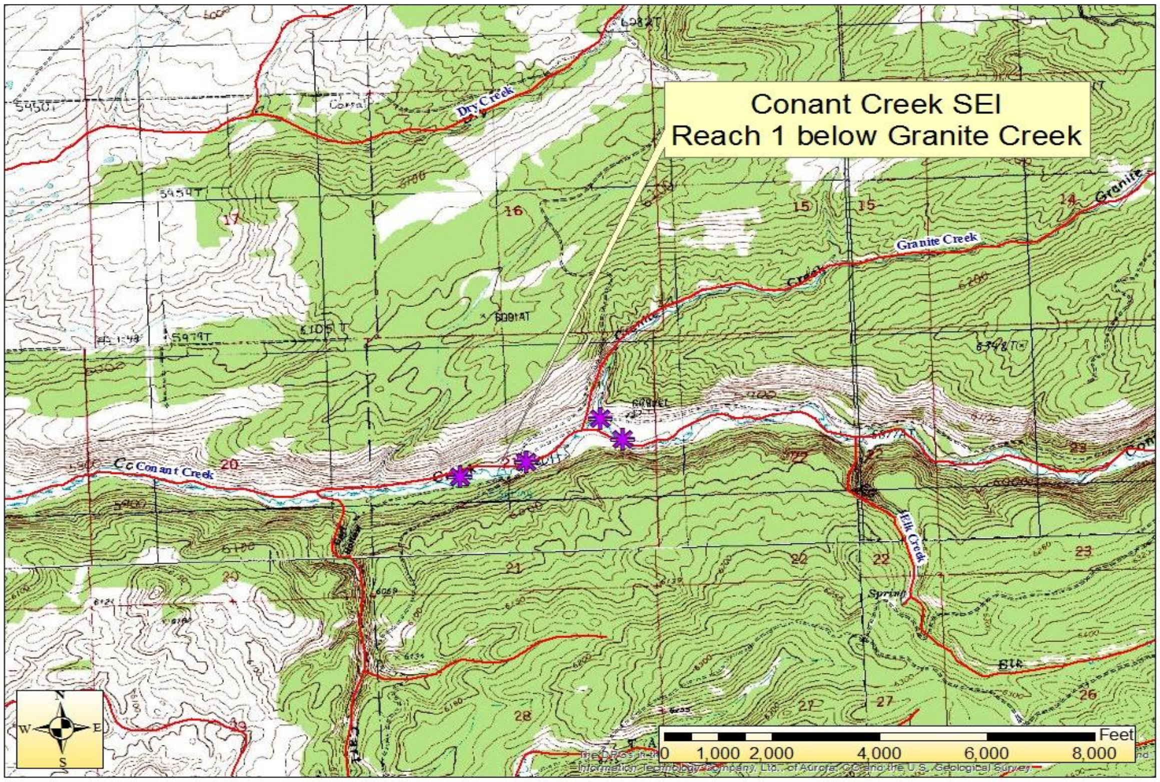

Conant Creek SEI
Reach 1 below Granite Creek
Dry Creek
Granite Creek
Conant Creek
Elk Creek
Feet
0 1,000 2,000 4,000 6,000 8,000

Table C8. Streambank erosion inventory calculation sheet for Conant Creek (ID17040203SK007_03).

STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET

Stream:	Conant Creek	**Stream Segment Location (DD)**	
Assessment Unit:	ID 17040203SK007_03	***Upstream N***	44.006310
Segment Inventoried:	upstream of Granite Creek	***W***	-111.142210
Total Reach:	295 meters (968 ft)	***Downstream N***	44.007520
Date Collected:	16-Jun-15	***W***	-111.143750
Field Crew:	Jack M. & M. Shumar	**Notes:**	Rosgen C channel
Data Reduced By:	M. Shumar		

Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flowpath distance)	968.00	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	85	lb/ft^3	Total Reach
Length of Similar Stream	27231	ft	Total Reach
Estimated Distance inventoried	1936.00	ft	"
Total Erosive Bank Length	99.50	ft	"
Percent Erosive Bank	5.1	%	"
Eroding Area (AE)	219.21	ft^2	"
Lateral Recession Rate (RLR)	0.045		"
Bank Erosion (E)	0.42	tons/year	"
Total Bank Erosion Rate (ER)	2.29	tons/mile/year	Reach and Segment
Total Bank Erosion	11.79	tons/year	"

Recession Rate Calculations

Factor	Field Stability Score	Erosion Severity Reduction
Bank Erosion Evidence (0 to 3)	0.5	0.25
Bank Stability Condition (0 to 3)	1	0.25
Bank Cover/Vegetation(0 to 3)	0.25	0.25
Lateral Channel Stability (0 to 3)	1.25	0.25
Channel Bottom Stability (0 to 2)	0	0.25
In-Channel Deposition (-1 to 1)	0.5	0
Total = Slight (0-4); Moderate (4-8); Severe (>8)	3.5	1.25
Lateral Recession Rate (RLR) (ft/yr)	**0.045**	**0.0225**

Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)	853.05	ft^2	Inventoried Segment
Bank Erosion at Load Capacity (E)	0.82	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	4.45	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	22.95	tons/year	Total Reach

Summary of Loads

Current Load		**Load Capacity**			
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Load Reduction Required?	Margin of Safety (tons/yr)
2.3	**11.8**	**4.4**	**22.9**	**No**	**0**

Percent Erosion Reduction (%)	**0**
Total Erosion Reduction (tons/yr)	**0**

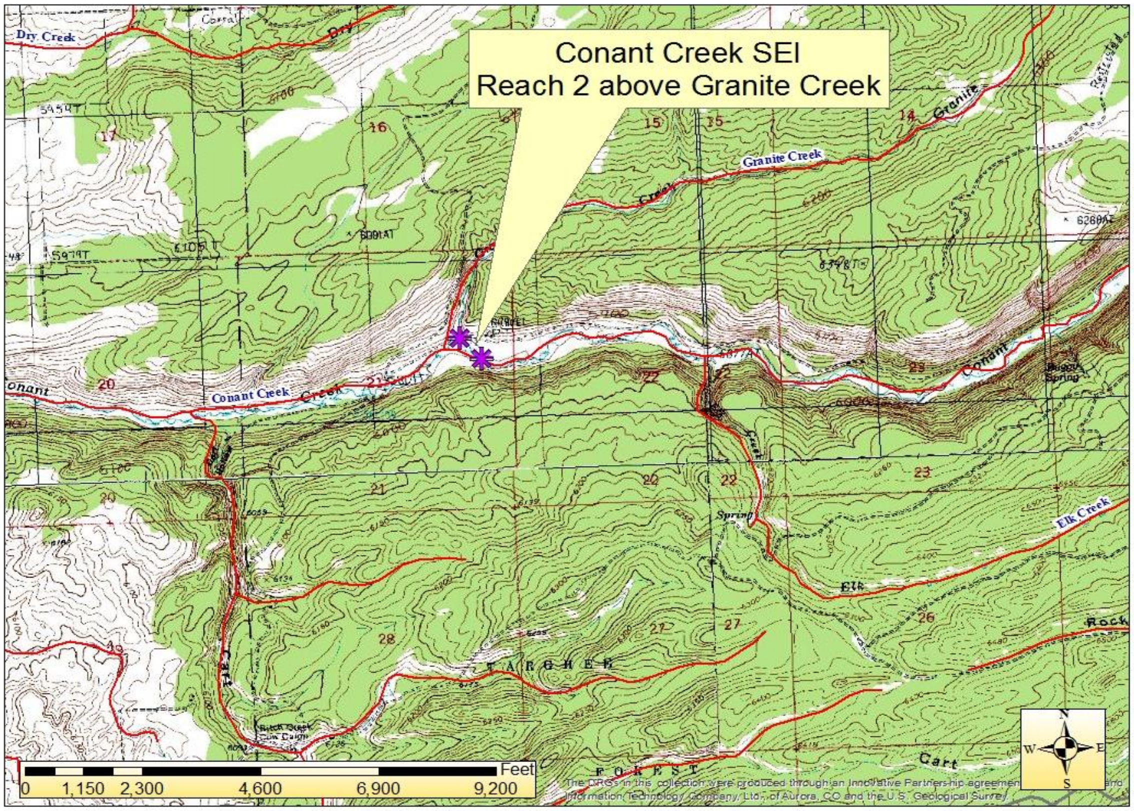

Conant Creek SEI
Reach 2 above Granite Creek
Dry Creek
Granite Creek
Conant Creek
Elk Creek
Feet
0 1,150 2,300 4,600 6,900 9,200
N
S
E
W

Table C9. Streambank erosion inventory calculation sheet for Sand Creek (ID17040203SK013_04).

STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET

Stream:	Sand Creek	**Stream Segment Location (DD)**	
Assessment Unit:	ID17040203SK013_04	***Upstream N***	44.106480
Segment Inventoried:	Reach 1	***W***	-111.584370
Total Reach:	348m (1142 ft)	***Downstream N***	44.104400
Date Collected:	15-Jun-15	***W***	-111.581710
Field Crew:	Jack M. & M. Shumar	**Notes:**	Rosgen C, St Anthony Sand Dunes
Data Reduced By:	M. Shumar		

Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flowpath distance)	1142.00	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	105	lb/ft^3	Total Reach
Length of Similar Stream	8707	ft	Total Reach
Estimated Distance inventoried	2284.00	ft	"
Total Erosive Bank Length	72.80	ft	"
Percent Erosive Bank	3.2	%	"
Eroding Area (AE)	127.72	ft^2	"
Lateral Recession Rate (RLR)	0.0375		"
Bank Erosion (E)	0.25	tons/year	"
Total Bank Erosion Rate (ER)	1.16	tons/mile/year	Reach and Segment
Total Bank Erosion	1.92	tons/year	"

Recession Rate Calculations		
Factor	**Field Stability Score**	**Erosion Severity Reduction**
Bank Erosion Evidence (0 to 3)	0.25	0.25
Bank Stability Condition (0 to 3)	0.75	0.25
Bank Cover/Vegetation(0 to 3)	0.25	0.25
Lateral Channel Stability (0 to 3)	0.5	0.25
Channel Bottom Stability (0 to 2)	0	0.25
In-Channel Deposition (-1 to 1)	1	0
Total = Slight (0-4); Moderate (4-8); Severe (>8)	2.75	1.25
Lateral Recession Rate (RLR) (ft/yr)	**0.0375**	**0.0225**

Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)	801.41	ft^2	Inventoried Segment
Bank Erosion at Load Capacity (E)	0.95	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	4.38	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	7.22	tons/year	Total Reach

Summary of Loads					
Current Load		**Load Capacity**			
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Load Reduction Required?	Margin of Safety (tons/yr)
1.2	**1.9**	**4.4**	**7.2**	**No**	**0**

Percent Erosion Reduction (%)	**0**
Total Erosion Reduction (tons/yr)	**0**

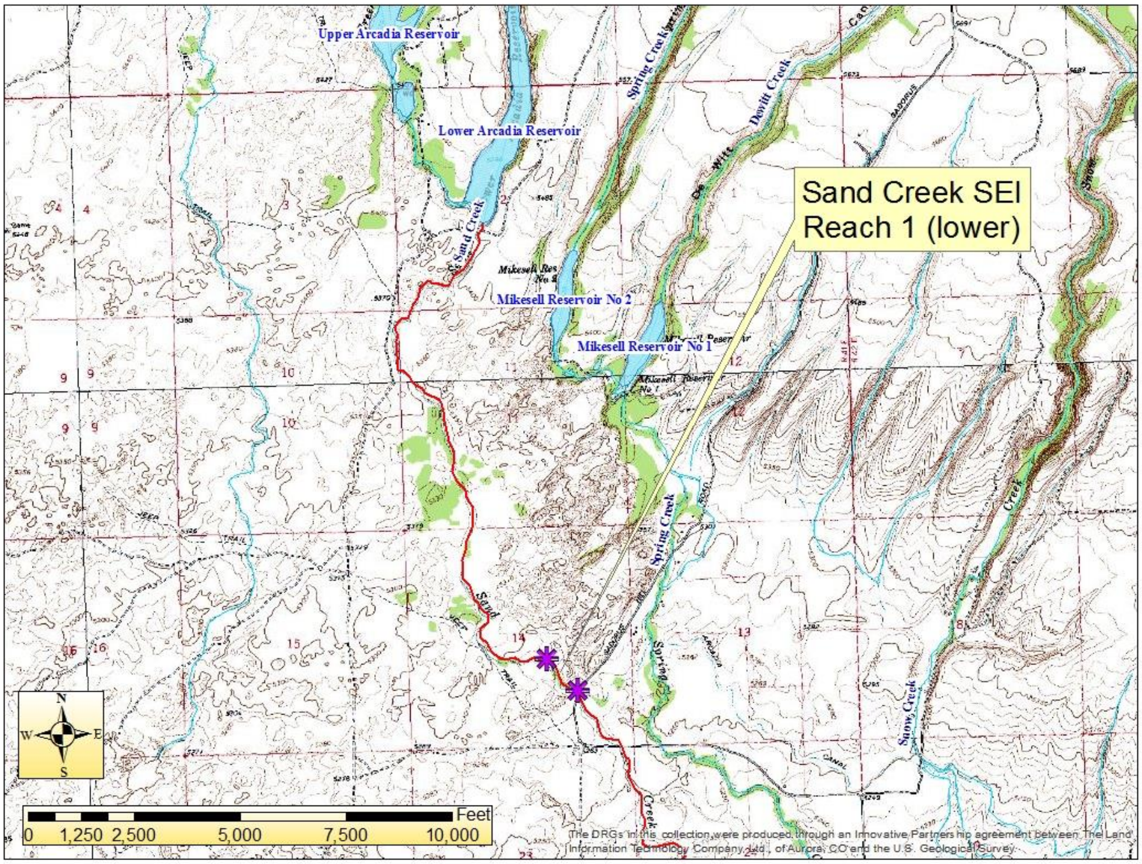

Sand Creek SEI
Reach 1 (lower)
Upper Arcadia Reservoir
Lower Arcadia Reservoir
Mikesell Reservoir No 2
Mikesell Reservoir No 1
Spring Creek
Snow Creek
Sand Creek
Feet
0 1,250 2,500 5,000 7,500 10,000
The DRGs in this collection were produced through an Innovative Partnership agreement between The Land Information Technology Company, Ltd., of Aurora, CO and the U.S. Geological Survey

Table C10. Streambank erosion inventory calculation sheet for Sand Creek (ID17040203SK013_04).

STREAMBANK EROSION INVENTORY CALCULATION WORKSHEET

Stream:	Sand Creek	**Stream Segment Location (DD)**	
Assessment Unit:	ID17040203SK013_04	***Upstream N***	44.128820
Segment Inventoried:	Reach 2 (upper)	***W***	-111.596730
Total Reach:	459m (1506 ft)	***Downstream N***	44.126030
Date Collected:	15-Jun-15	***W***	-111.597280
Field Crew:	Jack M. & M. Shumar	**Notes:**	Rosgen C, St Anthony Sand Dunes
Data Reduced By:	M. Shumar		

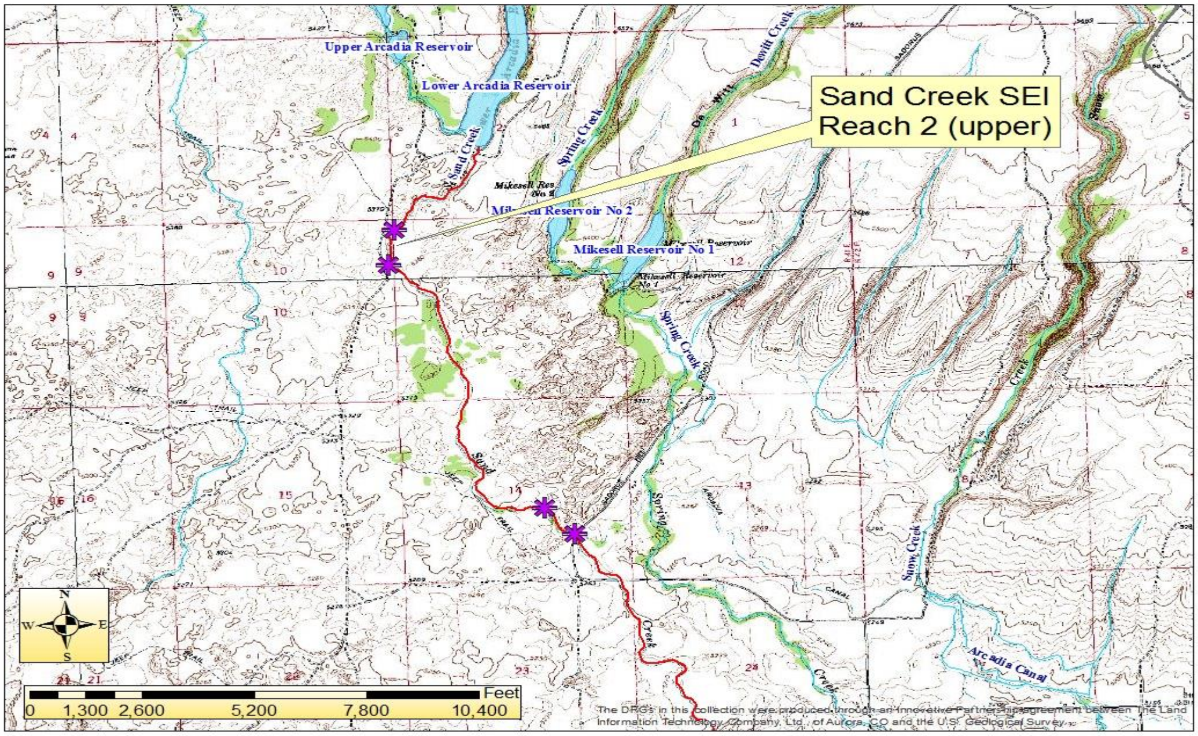
Current Load Streambank Erosion Calculations		Unit	Area Applied
Right, left or both bank measurements	2	Both Banks	Inventoried Segment
Inventory/Thalweg Length (LBB) (stream flowpath distance)	1506.00	ft	Inventoried Segment
TMDL Margin of Safety	10	%	Total Reach
Bulk Density (BD)	105	lb/ft^3	Total Reach
Length of Similar Stream	5787	ft	Total Reach
Estimated Distance inventoried	3012.00	ft	"
Total Erosive Bank Length	305.40	ft	"
Percent Erosive Bank	10.1	%	"
Eroding Area (AE)	6967.82	ft^2	"
Lateral Recession Rate (RLR)	0.05		"
Bank Erosion (E)	18.29	tons/year	"
Total Bank Erosion Rate (ER)	64.13	tons/mile/year	Reach and Segment
Total Bank Erosion	70.28	tons/year	"

Recession Rate Calculations		
Factor	**Field Stability Score**	**Erosion Severity Reduction**
Bank Erosion Evidence (0 to 3)	1	0.25
Bank Stability Condition (0 to 3)	0.75	0.25
Bank Cover/Vegetation(0 to 3)	0.25	0.25
Lateral Channel Stability (0 to 3)	1	0.25
Channel Bottom Stability (0 to 2)	0	0.25
In-Channel Deposition (-1 to 1)	1	0
Total = Slight (0-4); Moderate (4-8); Severe (>8)	4	1.25
Lateral Recession Rate (RLR) (ft/yr)	**0.05**	**0.0225**

Load Capacity Streambank Erosion Calculations for Total Reach		Unit	Area Applied
Eroding Area at Load Capacity (AE)	13743.99	ft^2	Inventoried Segment
Bank Erosion at Load Capacity (E)	16.24	tons/year	"
Total Bank Erosion Rate at Load Capacity (ER)	56.92	tons/mile/year	Reach and Segment
Total Bank Erosion at Load Capacity for Reach	62.39	tons/year	Total Reach

Summary of Loads					
Current Load		**Load Capacity**			
Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Total Bank Erosion Rate (tons/mile/yr)	Total Bank Erosion (tons/yr)	Load Reduction Required?	Margin of Safety (tons/yr)
64.1	**70.3**	**56.9**	**62.4**	YES	**7**

Percent Erosion Reduction (%)	**19**
Total Erosion Reduction (tons/yr)	**15**


Sand Creek SEI
Reach 2 (upper)
Upper Arcadia Reservoir
Lower Arcadia Reservoir
Mikesell Reservoir No 2
Mikesell Reservoir No 1
Spring Creek
Sand Creek
Snow Creek
Arcadia Canal
N
S
E
W
Feet
0 1,300 2,600 5,200 7,800 10,400
The DRGs in this collection were produced through an innovative Partnership agreement between The Land Information Technology Company, Ltd., of Aurora, CO and the U.S. Geological Survey.

Appendix D. Managing Stormwater

Municipal Separate Storm Sewer Systems

Polluted stormwater runoff is commonly transported through municipal separate storm sewer systems (MS4s), from which it is often discharged untreated into local water bodies. An MS4, according to 40 CFR 122.26(b)(8), is a conveyance or system of conveyances that meets the following criteria:

- Owned by a state, city, town, village, or other public entity that discharges to waters of the US
- Designed or used to collect or convey stormwater (e.g., storm drains, pipes, ditches)
- Not a combined sewer
- Not part of a publicly-owned treatment works (sewage treatment plant)

To prevent harmful pollutants from being washed or dumped into an MS4, operators must obtain an National Pollutant Discharge Elimination System (NPDES) permit from the US Environmental Protection Agency (EPA), implement a comprehensive municipal stormwater management program (SWMP), and use best management practices (BMPs) to control pollutants in stormwater discharges to the maximum extent practicable.

Industrial Stormwater Requirements

Stormwater runoff picks up industrial pollutants and typically discharges them into nearby water bodies directly or indirectly via storm sewer systems. When facility practices allow exposure of industrial materials to stormwater, runoff from industrial areas can contain toxic pollutants (e.g., heavy metals, organic chemicals) and other pollutants (e.g., trash, debris, oil, grease. This increased flow and pollutant load can impair water bodies, degrade biological habitats, pollute drinking water sources, and cause flooding and hydrologic changes (e.g., channel erosion), to the receiving water body.

Multi-Sector General Permit and Stormwater Pollution Prevention Plans

In Idaho, if an industrial facility discharges industrial stormwater into waters of the US, the facility must be permitted under EPA's most recent Multi-Sector General Permit (MSGP). To obtain an MSGP, the facility must prepare a stormwater pollution prevention plan (SWPPP) before submitting a notice of intent for permit coverage. The SWPPP must document the site description, design, and installation of control measures; describe monitoring procedures; and summarize potential pollutant sources. A copy of the SWPPP must be kept on site in a format that is accessible to workers and inspectors and be updated to reflect changes in site conditions, personnel, and stormwater infrastructure.

Industrial Facilities Discharging to Impaired Water Bodies

Any facility that discharges to an impaired water body must monitor all pollutants for which the water body is impaired and for which a standard analytical method exists (40 CFR Part 136).

Also, because different industrial activities have sector-specific types of material that may be exposed to stormwater, EPA grouped the different regulated industries into 29 sectors, based on their typical activities. Part 8 of EPA's MSGP details the stormwater management practices and monitoring that are required for the different industrial sectors. DEQ anticipates including specific requirements for impaired waters as a condition of the 401 certification. The MSGP will detail the specific monitoring requirements.

TMDL Industrial Stormwater Requirements

When a stream is on Idaho's §303(d) list and has a TMDL developed, DEQ may incorporate a wasteload allocation for industrial stormwater activities under the MSGP. However, most load analyses developed in the past have not identified sector-specific numeric wasteload allocations for industrial stormwater activities. Industrial stormwater activities are considered in compliance with provisions of the TMDL if operators obtain an MSGP under the NPDES program and implement the appropriate BMPs. Typically, operators must also follow specific requirements to be consistent with any local pollutant allocations. The next MSGP will have specific monitoring requirements that must be followed.

Construction Stormwater

The Clean Water Act requires operators of construction sites to obtain permit coverage to discharge stormwater to a water body or municipal storm sewer. EPA has issued a general permit for stormwater discharges from construction sites.

Construction General Permit (CGP) and Stormwater Pollution Prevention Plans

If a construction project disturbs more than 1 acre of land (or is part of a larger common development that will disturb more than 1 acre), the operator is required to apply for a CGP from EPA after developing a site-specific SWPPP. The SWPPP must provide for the erosion, sediment, and pollution controls they intend to use; inspection of the controls periodically; and maintenance of BMPs throughout the life of the project. Operators are required to keep a current copy of their SWPPP on site or at an easily accessible location.

TMDL Construction Stormwater Requirements

When a stream is on Idaho's §303(d) list and has a TMDL developed, DEQ may incorporate a gross wasteload allocation for anticipated construction stormwater activities. Most loads developed in the past did not have a numeric wasteload allocation for construction stormwater activities. Construction stormwater activities are considered in compliance with provisions of the TMDL if operators obtain a CGP under the NPDES program and implement the appropriate BMPs. Typically, operators must also follow specific requirements to be consistent with any local pollutant allocations. The CGP has monitoring requirements that must be followed.

Postconstruction Stormwater Management

Many communities throughout Idaho are developing rules for postconstruction stormwater management. Sediment is usually the main pollutant of concern in construction site stormwater. DEQ's *Catalog of Stormwater Best Management Practices for Idaho Cities and Counties* (DEQ

2005) should be used to select the proper suite of BMPs for the specific site, soils, climate, and project phasing to sufficiently meet the standards and requirements of the CGP. Local ordinances with more stringent and site-specific standards are applicable.

Appendix E. Pollutant Trading

Pollutant trading (also known as water quality trading) is a contractual agreement to exchange pollution reductions between two parties. Pollutant trading is a business-like way of helping to solve water quality problems by focusing on cost-effective, local solutions. Pollutant trading is one of the tools available to meet reductions called for in a TMDL where point and nonpoint sources both exist in a watershed.

The appeal of trading emerges when pollutant sources face substantially different pollutant reduction costs. Typically, a party facing relatively high pollutant reduction costs compensates another party to achieve an equivalent, though less costly, pollutant reduction.

Pollutant trading is voluntary. Parties trade only if both are better off because of the trade, and trading allows parties to decide how to best reduce pollutant loadings within certain requirements.

Pollutant trading is recognized in Idaho’s water quality standards (IDAPA 58.01.02.055.06). DEQ allows for pollutant trading as a means to meet TMDLs and restore water quality limited water bodies to compliance. DEQ’s *Water Quality Trading Guidance* sets forth the procedures to be followed for pollutant trading (DEQ 2016c).

Trading Components

The major components of pollutant trading are trading parties (buyers and sellers) and credits (the commodity being bought and sold). Ratios are used to ensure environmental equivalency of trades on water bodies covered by a TMDL. All trading activity must be recorded in the trading database by DEQ or its designated party.

Both point and nonpoint sources may create marketable credits, which are a reduction of a pollutant beyond a level set by a TMDL:

- Point sources create credits by reducing pollutant discharges below NPDES effluent limits set initially by the wasteload allocation.
- Nonpoint sources create credits by implementing approved BMPs that reduce the amount of pollutant runoff. Nonpoint sources must follow specific design, maintenance, and monitoring requirements for that BMP; apply discounts to credits generated, if required; and provide a water quality contribution to ensure a net environmental benefit. The water quality contribution also ensures the reduction (the marketable credit) is surplus to the reductions the TMDL assumes the nonpoint source is achieving to meet the water quality goals of the TMDL.

Watershed-Specific Environmental Protection

Trades must be implemented so that the overall water quality of the water bodies covered by the TMDL is protected. To do this, hydrologically-based ratios are developed to ensure trades between sources distributed throughout TMDL water bodies result in environmentally equivalent or better outcomes at the point of environmental concern. Moreover, localized adverse impacts to water quality are not allowed.

Trading Framework

For pollutant trading to be authorized, it must be specifically mentioned within a TMDL document. After adoption of an EPA-approved TMDL, DEQ, in concert with the watershed advisory group, must develop a pollutant trading framework document. The framework would mesh with the implementation plan for the watershed that is the subject of the TMDL. The elements of a trading document are described in DEQ's trading guidance (DEQ 2016c).

Appendix F. Public Participation and Public Comments

This TMDL was developed with participation from the Henrys Fork Watershed Council through technical meetings and review. The Council supported the beginning of the public comment period on March 12, 2019 after DEQ presented the final draft to the entire watershed council.

Environmental Protection Agency - Comments and Questions - Lisa Kusnierz
Department of Environmental Quality - Responses - Cory Sandow

EPA Comment -

1. **Executive Summary & Subbasins at a Glance (pages vii; ix):** The document references the 2014 Integrated Report (IR) as the most recent federally approved IR, but EPA approved DEQ's 2016 IR on June 25, 2019. Please update the document to reference the 2016 IR as the most recent federally approved IR.

DEQ Response - References to the 2014 Integrated Report have been updated to the 2016 version. The 2016 Integrated Report is cited as 2018 as that is the published date, not the approval date.

EPA Comment -

2. **Key Findings and General Comment (page ix):** The document states, *"Streambank erosion inventories (SEIs) were completed within AUs in the two subbasins to determine if the combined biota/habitat bioassessment listings could be attributed to excess stream sedimentation."*
   Based on this statement and other similar statements, it appears the identification of sediment as the cause of impairment and basis for developing a sediment TMDL is based only on streambank erosion inventories. The discussion of fine sediment on page 23 cites having an 80% or greater streambank stability as being associated with a level of fine sediment protective of fish spawning habitat, but additional discussion is recommended regarding the context for associating sediment as the cause of combined biota/habitat bioassessment impairment.

DEQ Response - TMDLs were created for AUs where SEI data indicated an exceedance of background condition. Background condition is assumed to correlate to 20% erosive banks as explained in Section 5.2. SEI was a method used in clarifying impairments to AUs listed for Combined Biota/Habitat Assessment as excess sedimentation is a common cause for that impairment. Line 6 of the first paragraph of the Key Findings sections states why SEIs were considered. Paragraphs following Table B detail why improper assessments led to an incorrect listing or introduce the conditions why TMDLs were not developed at this time.

TMDLs were created where SEIs indicated streambank erosion levels are exceeding background, but an exceedance of background does not necessarily mean sediment is causing the impairment. DEQ understands that generally combined biota/habitat bioassessment impairments are caused by sediment or temperature impacts that are otherwise difficult to discern using available data. DEQ will more closely look at metric data available from BURP sampling to identify potential causes of impairment. Examples of data that are available include the Fine Sediment Biotic

Index, the relative abundance of sediment sensitive macroinvertebrate taxa, percent surface fines, and scores of embeddedness. These data points can provide the justification to pursue the investigation of sediment loads for TMDL development. Additionally, water temperature data can be collected to determine if stream temperatures are compounding the combined biota/habitat bioassessment impairment listing.

3. **Key Findings & Section 2.3.2 (pages ix – xii; 9 - 12):** The document proposes a reorganization of the Twin Creek/Henrys Lake Outlet assessment units (AUs) based on land ownership boundaries and land type/use. The text on pages 10 and 12 reads, *"[t]he current AU alignment and the proposed AU realignment are shown in Figure 2 and Figure 3. The existing USFS boundary appears as a straightforward means to identify where to make the necessary AU splits and joins. Until AUs are reorganized, a TMDL for the Twin Creek AU has been calculated and is representative of conditions found in the lower portion of the AU in the valley bottom. If the proposed AU realignment had already been in effect, the TMDL as written would apply to the Henrys Lake Outlet AU."*
   All recommended changes (including delistings and AU splits) to the next Integrated Report will need to be submitted through the Integrated Report process and go through separate review by EPA. At that time, EPA will review the rationale and supporting data and information before determining if we approve the delisting and/or AU change.
   EPA recommends the document be modified to state in the Key Findings or Section 2.3.2 how DEQ intends to modify the TMDL if/when the AUs are reorganized in the future and approved by EPA. A table listing the current and proposed reorganized AUs and their respective pollutant loads would help readers understand how the TMDL would be implemented if the AU were modified.

DEQ Response – DEQ incorporated AU realignment and added additional text to explain new AU alignment.

EPA Comment -

4. **Section 2.2.2 (page 7):** The document does not identify downstream receiving waters and their applicable water quality standards for sedimentation and E. coli. EPA recommends that DEQ consider including this information in this section.

DEQ Response - DEQ believes allocations developed in this TMDL will not cause or contribute to downstream impairments if present. Allocations presented in the TMDL are designed to be protective of beneficial uses and meet water quality standards.
Additional text has been added to the main body of the document describing downstream waters and their beneficial uses.

EPA Comment-

5. **Section 3.2 – 4.1 (pages 15-16):** The document states *"Land uses in the subbasins consist mainly of grazing and recreation. Nonpoint sources of pollution associated with these land uses include sediment delivery, increased temperature loading, and in some cases, elevated bacteria. This type of nonpoint source pollution can occur over a wide area of the subbasins."* In Section 3.3, the document goes on to state, *"Unprotected stream fords and mismanaged road maintenance can also deliver large amounts of sediment to streams,"* and many of the projects summarized in Section 4.1 focus on improvements to roads and stream crossings.

Please include a broader discussion of nonpoint sources that explains why the source assessment focused on streambank erosion.

DEQ Response - DEQ relies on input from other land management agencies and conservation districts to help inform the magnitude of nonpoint sources. DEQ uses select methodologies to capture streambank erosion loads, or to calculate an approximate volume or proportion of surface fines in AUs where data has been collected. Section 3 explains the pollutant loads in the subbasin to further describe the settings the AUs are found in. No changes were made to the document.

EPA Comment -

6. **Section 5.1, 5.1.1 and/or 5.1.2 (page 23-24):** Beneficial uses are protected against sedimentation levels through a narrative standard. In Section 5.1 the document describes how the narrative standard is translated using a streambank stability rate of 80% as a surrogate target. This calculation seems to be embedded in field notes included in Appendix C. The TMDL document should explicitly include the equation for how the 80% streambank stability rates are used to calculate annual sediment delivery rates based on streambank erosion inventory data.

DEQ Response - Additional text stating how TMDLs were calculated has been added to Section 5.1. Additional text further describing that the SEI method samples a representative stream reach that is used to describe the sediment load for the AU has been added. Additionally, a citation to DEQ's SOP for SEI sampling has been included.

EPA Comment -

7. **Tables 4 & 5 (pages 26-27):** The math and methodology used to calculate the load allocation for sedimentation does not appear to be correct. Text under Section 5.1.6 on page 26 specifies, *"The annual load allocation expresses the difference between the current sediment load volume (Table 4) and the load capacity (including a 10% MOS) of the impaired AUs (Table 5). The 10% MOS is added to the load reduction to ensure beneficial use restoration."*

   What is described as the load allocation is the annual reduction needed, not the amount of loading allocated to nonpoint sources. After the load capacity is calculated, the 10% margin of safety (MOS) should be calculated and subtracted from the load capacity. In the absence of wasteload allocations and an allocation to future growth, the remaining portion of the load capacity is the load allocation. EPA agrees it is important to emphasize the reduction in loading required to meet the TMDL but that reduction in loading is not the load allocation. The load analysis shown in Table 5 does not appear to have been calculated properly and should be revised – it seems that the listed load allocations are the required reductions from the current loads listed in Table 4. For example, Twin Creek's load allocation (7 tons/year) exceeds the load capacity (2 tons/year). This is not permissible under the TMDL program – by definition, load allocations cannot exceed load capacities. Additionally, the MOS is listed as 1 ton/year, which is 50% of the defined load capacity, rather than the 10% described in Section 5.1.6.1. For Sand Creek, the load allocation is listed as 15 tons/year and the MOS is listed as 7 tons/year, but the load capacity is specified as 62 tons/year – there is no discussion about why the sum of the MOS and load allocation are less than the load capacity, in the absence of permitted point sources.

EPA also recommends Table 5 be modified to include the percent reduction (as was done for E. coli), which is helpful in conveying the magnitude of improvement required to meet beneficial uses.

DEQ Response - Agreed. The calculations as presented are in error. Table 5 has been updated with corrected current load, load capacity, and load reductions needed.

EPA Comment -

8. **Section 5.1.6.1 (page 27):** The MOS for sediment is specified as 10% of the load capacity to ensure beneficial uses will be restored, but the document does not discuss the rationale for this approach. EPA recommends including an explanation for why a 10% MOS was used.

DEQ Response - Section 5 of the document states that 40 CFR Part 130 requires a margin of safety be included in the TMDL. Text added to Section 5.1.6.1 to further describe why a 10% MOS was used.

EPA Comment -

9. **Section 5.2.4 (page 30):** It appears the existing daily load and load capacity values in Table 7 were calculated incorrectly. The values should be revised, and EPA recommends including the conversion information

DEQ Response - Agreed. The load calculations for bacteria were incorrect. The bacteria TMDL section has been revised and with new calculations.

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10. **Section 5.2.4.1 (page 30):** EPA is supportive of calculating the load capacity for E. coli during the summer, the most critical time period, and then applying that load capacity year-round. However, while these conservative methods may provide an implicit MOS during the winter (and other non-critical time periods), they do not provide an implicit MOS during the most critical time period when bacteria concentrations are expected to be highest and when secondary contact recreation is most likely to occur. DEQ should to consider if other conservative assumptions/methods apply to the calculation of the load capacity for E. coli, particularly during the summer, or if an explicit MOS is warranted.

DEQ Response – DEQ incorporated a 10% explicit MOS and provided text justifying the MOS.

Bureau of Land Management Upper Snake Field Office - Comments and Questions - Ryan Beatty
Department of Environmental Quality - Responses - Cory Sandow

BLM Comment -
Date: 1/29/2020
From: Ryan J Beatty, BLM Upper Snake Field Office Fisheries Biologist
To: Troy Saffle IDEQ Idaho Falls Region Surface Water Quality Manager and Jeremy Casterson - BLM Upper Snake Field Office Manager
Subject: HUC 17040202 and 17040203 - Upper and Lower Henrys Fork subbasins TMDL. This summary of BLM information and select monitoring or management recommendations is intended to provide to IDEQ as part of the public comment process for the subject TMDL document. Several assessment units encompassed BLM lands, and two streams on BLM lands will have established TMDLs related to sedimentation and E. coli. These streams include Sands Creek (downstream of lower Arcadia Reservoir) and Timber Creek (tributary to Henrys Lake), respectively.
Timber Creek (Assessment Unit - ID17040202SK035_03)
The Timber Creek Assessment Unit (AU) was included in Category 5 of the 2014 Integrated Report for bacteria impairment. In the subject TMDL document IDEQ proposes to finalize the TMDL in Category 4a for Escherichia coli (E. coli) with approval from EPA.
The BLM administers lands around Henrys Lake, including Timber Creek near its confluence with the lake. The contiguous parcel of BLM lands containing Timber Creek total approximately 90 acres. A portion of these lands (≈20 acres) were previously privately owned but acquired by the BLM in the year 2000. It created a more contiguous parcel of BLM lands, which are managed for open space and conservation value. They have not been authorized for livestock grazing, and privately owned fences along the boundary predominately exclude livestock access to BLM lands from adjacent private lands.
The BLM lands contain approximately 0.6 miles of sinuous mainstem Timber Creek channel, and ≈0.3 miles of a secondary Timber Creek channel or spring/seep tributary with intermittent surface flow. The reach lies in close proximity to Henrys Lake, with its mouth only 350 meters downstream of the BLM boundary. The BLM lands are surrounded by fenced private land, but Timber Creek skirts the boundary in several areas with varying degrees of livestock access potential. Two distinct areas of livestock-stream interaction in the form of fenceline water gaps to Timber Creek are known to occur on BLM lands.
Near the downstream end of the BLM reach (Lat 44.6695, Long-111.4274), just upstream of the main Henrys Lake Road crossing of Timber Creek, the private fence alignment creates a livestock water gap access from the private lands to the East. However, the remainder on Timber Creek on nearby private lands upstream of the road are fenced to limit livestock access. Recurring concentrations of livestock use at this fenceline water gap are evident in recent air photos, and annual use appears to be ongoing.
Approximately 300 meters upstream the other livestock water gap on BLM lands exists (Lat 44.6704, Long -111.4298). This water gap is associated with a BLM authorized Right of Way (ROW). This ROW was issued in conjunction with the BLM acquisition of lands. As such the BLM acquired lands to manage for conservation value, but this necessitated a relatively narrow fenced water gap (≈30 ft wide and crossing Timber Creek) to provide livestock water for the adjacent private land. Based on review of air photos, the intensity of livestock access at this

ROW water gap is less than which occurs downstream. Based on communication with the landowner in 2014, the level of use of the ROW water gap is thought to occur annually, for a short duration, with up to 10 cow/pairs.

Henrys Lake is one the most valuable lake fisheries in the Western U.S. and its surrounding landscape offers a unique blend of intact wildlife habitat, home development, eco-tourism and livestock grazing on private ranches and public lands. Management of wildlife habitat, riparian areas, aquatic resources and other sustainable land use practices associated with BLM lands around Henrys Lake is a high priority for the Upper Snake Field Office. The BLM acknowledges the potential for these livestock water gaps to contribute to E. coli exceedances and appreciates the opportunity to provide more information and comment in the TMDL process. The BLM Upper Snake Field Office would like to make suggestions, regarding: 1) further water quality monitoring and potential sample locations to further assess E. coli concentrations and relative potential contribution of the aforementioned water gap locations ; 2) Suggest pursuit of collaborative stakeholder engagement among BLM, IDEQ, IDFG and adjacent private land owners to further assess the need, efficacy and potential alternatives to the existing fenced water gap locations described above.

BLM suggested monitoring locations: The most recent data used to calculate an appropriate and required 30-day geometric mean was collected in 2003. Data collected by IDEQ in 2015 was found to be comparable to values measured in 2003. However, 2015 data is described as insufficient to accurately assess representative bacteria concentrations in the AU (2019 Upper Henrys Fork TMDL Pg. 8). The BLM Upper Snake Field Office recommends additional sample collection to be conducted during upcoming field seasons to further assess E. coli concentrations and inform potential future adaptive management on the part of the BLM. If the BLM Upper Snake Field Office can provide support in the form of coordination, access, or field work for sample collection please contact Ryan Beatty, BLM Upper Snake Field Office Fisheries Biologist (rbeatty@blm.gov 208-524-7509).

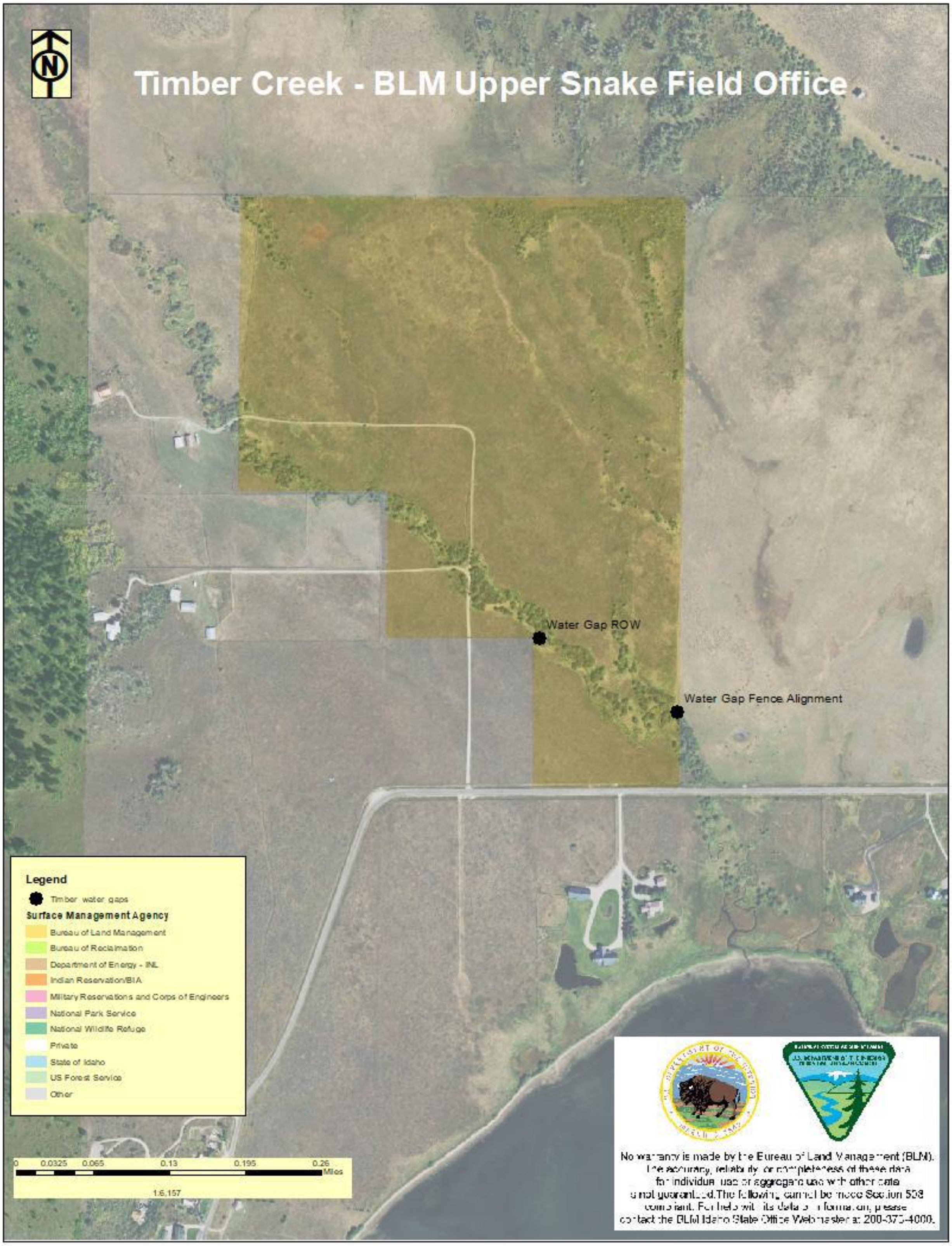
To further assess E. coli or other water quality parameters, the BLM suggests monitoring downstream of the lower fence alignment water gap near Henrys Lake Road. This location would lie downstream of the entirety of Timber Creek on BLM lands, provide a basis for comparison to samples collected upstream. Samples from this location would contribute to assessment of the potential relative pollutant contribution from the lower fence alignment water gap. This location is accessible on BLM lands along Henrys Lake Road or at the County Road Culvert/bridge. Based on review of Figure 4 on page 29 of the 2019 TMDL for Upper and Lower Henrys Fork, the current monitoring location used by IDEQ appears to be consistent with the BLM suggested site near Henrys Lake Road. In which case, continued use of this location would be consistent with the BLM recommendation.

Just upstream from this location, approximately 300 m, the addition of a monitoring location just below the livestock water gap ROW on BLM lands (Lat 44.6704, Long -111.4298) would allow for comparison of relative potential contribution among the two BLM water gap locations on Timber Creek.

Finally, the addition of a monitoring location near the upstream end of Timber Creek on BLM lands, above both water gap locations, would benefit assessment of the water gaps and baseline condition of water quality as flows enter BLM lands. This may also contribute to assessment of unknown bacteria concentrations from upstream areas which have the potential to contribute to the E. coli bacteria load observed the third order segment of Timber Creek. The BLM feels expanded sample collection areas would benefit assessment of E. coli in Timber Creek and aid

BLM and other stakeholders in evaluation of potential adaptive management actions associated with contributing factors and livestock water gap access on BLM lands.

BLM Proposed Stakeholder Coordination Meeting: During the upcoming field season, BLM proposes to coordinate a field visit and discussion with IDEQ, IDFG, adjacent private landowners and other interested stakeholders or NGOs. The group would be able to view and discuss areas of direct livestock access on BLM lands along Timber Creek. The objective of the meeting would be to introduce the stakeholders, assess potential participation, and brainstorm adaptive management actions. Critically, the group could convene to engage and inform adjacent private landowners as to the situation and opportunity to collaborate with stakeholders to improved water quality in Timber Creek and incrementally benefit overall water quality in Henrys Lake. If amenable to IDEQ, please contact BLM Upper Snake Field Office at your convenience to discuss the timing, topics, and location of the proposed meeting later in 2020.


N
Timber Creek - BLM Upper Snake Field Office
Water Gap ROW
Water Gap Fence Alignment
Legend
Timber water gaps
Surface Management Agency
Bureau of Land Management
Bureau of Reclamation
Department of Energy - INL
Indian Reservation/BIA
Military Reservations and Corps of Engineers
National Park Service
National Wildlife Refuge
Private
State of Idaho
US Forest Service
Other
0 0.0325 0.065 0.13 0.195 0.26
Miles
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No warranty is made by the Bureau of Land Management (BLM).

Sands Creek – Pine Creek to Mouth (Assessment Unit - ID17040203SK013_04)

In the subject TMDL, Table 4 on page 26 identifies the land use in the AU Sand Creek-Pine Creek to mouth (ID17040203SK013_04) as being "BLM". Certainly, BLM managed lands and authorized livestock grazing comprises a portion of the land uses in this AU near the upstream end. However, Sand Creek – Pine Creek to Mouth is roughly 9 miles in stream length, of which ≈1.9 miles are on BLM lands and ≈7.1 miles are private land. Given the relative composition among BLM stream miles and private land stream miles, the dominant land use may not be most accurately described as "BLM".

Sand Creek traverses BLM lands in the upper three miles of creek downstream of the Lower Arcadia Reservoir outlet. Within this upper three-mile reach, a total of approximately 1.9 miles of Sand Creek lies on BLM lands within three BLM authorized livestock grazing allotments, including: Pine Creek Allotment, Spring Creek Allotment, and Sand Creek Allotment. The remainder of the upper three-mile reach is on private lands, but within the boundaries of the aforementioned BLM grazing allotments. The remainder of Sand Creek, downstream of BLM lands to its mouth, is ≈6 miles long and entirely on private lands.

Pine Creek Allotment: The upstream-most and longest Sand Creek reach (≈ 1.3 miles) on BLM lands occurs in the Pine Creek Allotment, downstream of Lower Arcadia Reservoir. The upper IDEQ SEI site (Sands Creek-2) from 2015 fell within the Pine Creek Allotment reach. However, the monitoring location was near a cluster of dispersed motorized travel routes and two user created stream ford crossings. The BLM recommends IDEQ consider additional monitoring locations in this upper reach. Because the most recent data was collected in 2015, the BLM also recommends that more current data be collected. While roads and fords may exacerbate sedimentation, the parent geology is dominated by sandy soils. The uppermost 700 meters of channel near the outfall of Lower Arcadia Reservoir are deeply incised with a stream channel bound by sparsely vegetated steep sandy hillslope topography. Given the steep slope and sparse vegetation, the upper ≈700 meters are likely a significant and persistent source of sediment relative to the remainder of the AU.

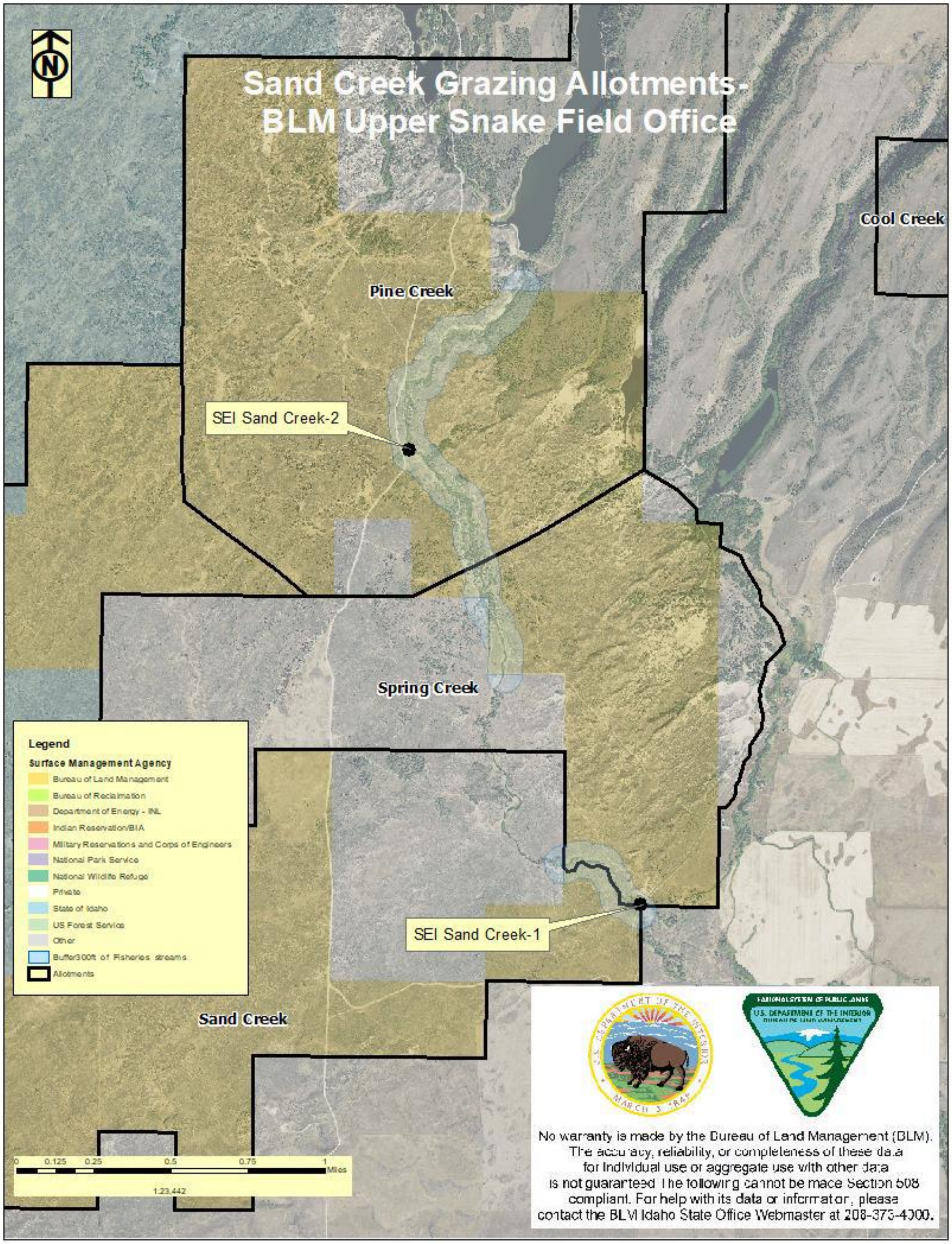
This allotment was previously assessed by the BLM in 1999 and 2011. Evaluators acknowledge the predominately sandy soils and stream substrates limit the potential of Sand Creek. Streambank instability and excessive fine sediment composition was largely attributed to underlying geology of stabilized sand dunes, with streambanks and stream channel dominated by sandy soils except where basalt bedrock outcrops existed. In 1999, stream channel condition was assessed to not meet BLM standards for Rangeland Health, but not due to ongoing livestock grazing; an over-widened channel and mid-channel bars were interpreted as signs of naturally inherent streambank instability and excessive erosion attributed to sandy soils and flow alterations from the reservoir. In 2011, Sand Creek stream channels were visually assessed to be meeting BLM standards for Rangeland Health and observers noted that riparian vegetation along Sands Creek was adequately stabilizing banks and dissipating energy associated with typical stream flows.

Generally, the BLM Upper Snake Field Office manages streams to maintain or make progress towards ≥80% streambank stability and ≥85% streambank cover by vegetation, rock or wood. As stated in the subject TMDL document "The upper SEI site below Lower Arcadia Reservoir revealed excessive sedimentation and a load reduction of up to 15 tons per year was needed. In this region of Idaho, 80% streambank stability is used as a surrogate target for supporting beneficial uses relative to excess sedimentation. As such, the 80% bank stability target based on SEIs will be the target for sediment in this TMDL. The 80% target has been used in other TMDLs throughout the state and is protective while still allowing for sediment fluctuation present in natural systems."

Ongoing BLM authorized grazing and continued management is anticipated by the BLM to allow maintenance or recovery of streambank stability relative to natural limiting factors associated with the predominately sandy soils comprising the streambanks. Based on the results of IDEQ SEI data and TMDL development for this reach of Sand Creek, the BLM will consider adding this stream to the upcoming 2020 and 2021 monitoring priority list and consider establishment of a Designated Monitoring Area (DMA) for the purpose of short-term livestock use monitoring (stubble height, streambank alteration) and long-term streambank stability monitoring using the BLM Multiple Indicator Monitoring (MIM) method.

Spring Creek Allotment: Progressing downstream of the Pine Creek Allotment, the Spring Creek Allotment contains ≈ 0.25 miles of Sand Creek on BLM lands. Previous BLM assessments of riparian vegetation and stream channel condition resulted in a determination that conditions were in an improving trend between 2000 and 2010. In 2010, riparian vegetation and stream channel conditions were assessed to be in proper functioning condition and meeting BLM standards of Rangeland Health. However, observers noted visual indications of excessive fine sediment in the stream channel, likely attributable to the typical bedload movement and sandy soils which comprise the streambanks.

Sand Creek Allotment: Progressing downstream from the Pine Creek Allotment and Spring Creek Allotment, lies the Sand Creek Allotment. Approximately 0.36 miles of Sand Creek occurs on BLM lands in the allotment. The IDEQ SEI site Sand Creek-1 occurs near the downstream end of this reach and downstream end of the entire reach on BLM lands. Results of the SEI in 2015 and BURP data collected in 2004 indicated that no impairment from excessive sedimentation was occurring and streambanks were generally covered and stable. Similar observations were made by the BLM. The BLM assessed this 0.36-mile reach of Sand Creek in July 2008 and rated the channel characteristics as properly functioning. Streambank stability was estimated overall to be ≈ 90% to 95%, with a dense sedge/rush community along both banks.


N
Sand Creek Grazing Allotments-
BLM Upper Snake Field Office
Cool Creek
Pine Creek
SEI Sand Creek-2
Spring Creek
SEI Sand Creek-1
Sand Creek
Legend
Surface Management Agency
Bureau of Land Management
Bureau of Reclamation
Department of Energy - INL
Indian Reservation/BIA
Military Reservations and Corps of Engineers
National Park Service
National Wildlife Refuge
Private
State of Idaho
US Forest Service
Other
Buffer300ft of Fisheries streams
Allotments
0 0.125 0.25 0.5 0.75 1 Miles
1:23,442
No warranty is made by the Bureau of Land Management (BLM).
The accuracy, reliability, or completeness of these data
for individual use or aggregate use with other data
is not guaranteed. The following cannot be made Section 508
compliant. For help with its data or information, please
contact the BLM Idaho State Office Webmaster at 208-373-4000.

DEQ Response - DEQ strives to collect the most representative and accurate data possible concerning Idaho's surface waters in their monitoring and assessment and TMDL programs. Comments received from BLM are very constructive and will help in collecting useful data in determining impairment conditions to guide implementation programs.

Appendix G. Distribution List

Henrys Fork Watershed Council

United State Forest Service

Upper Snake Basin Advisory Group